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The impact of Design Thinking on education: The case of Active Learning Lab

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A mia madre,
colei che mi ha dato tutto

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Introduction

In recent years, Design Thinking methodology has become more and more important by expanding its fields of application: starting from the design world, going through the business world, to arrive to the world of education.

The world of work is constantly evolving with the need to continually change, in order to face ever-increasing challenges given by the changing needs of consumers, thus requiring businesses a rapid adaptation. Because of this phenomenon, it is necessary to change training for university students as well, so to keep up with the world of work and its needs. At the same time, access to the workplace is characterized by a high level of competitiveness along with various professional skills and since technical competence is taken for granted, there is always a growing need to develop the so-called transversal abilities in students.

Based on this context, an innovative didactic course has been created at Ca' Foscari University in Venice for its fifth edition, in order to bring companies and participants into close contact by using Design Thinking methodology.

Design Thinking is a problem-solving methodology, the most recognizable definition, being this feature provided by CEO of Tim Brown's IDEO: "*is a human-cantered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success. "*

The choice in dealing with Design Thinking was born from awareness gained during my study path and by attending the first edition of the Learning Lab, whose goal is to understand whether this method really provided students with necessary toolkit and an effective approach towards the world of work. In addition, it was also to verify if this could develop wider awareness of what the world of work actually is by providing transversal competencies, which are usually not promoted in a traditional training.

The script begins, in the first chapter, with the definition of design, taking as an example those ones carried out by Simon and Thomas Maldonado, two of the Design's founding fathers. Subsequently, the research highlights the main historical stages of Design Thinking evolution, to arrive to further definition and development. The analysis continues with the presentation of the main features of this methodology: the Human centered approach, to explain this latter concept, a framework provided by Verganti

was used, explaining the contrast between a design thinking approach and a Design-Driven innovation; creativity, taking as a starting point Tom Kelley's advice, in order to stimulate and to develop it; the importance of collaborating with a multidisciplinary team by examining the effects that this can generate. In addition, the Design Thinking process was expressed by specifying each step of the methodology, by providing different approaches coming from the leading Design schools and companies: starting from the "3 I" model developed by IDEO, subsequently the one developed by the Bill & Melinda Gates foundation called HDC Model and finally, the one developed by the Stanford and Postdam schools. The chapter ends with the application of Thinking Design in the sphere of business, taking into account the cases of P&G, Airbnb and IDEO and exposing some criticisms of this methodology on behalf of business experts in the sector.

The second chapter focuses on the application of Design Thinking in the field of education, initially providing examples experienced by Design major schools: Stanford and Postdam, and subsequently highlighting the importance of Design Thinking in the field of education. Indeed, the main benchmarks are fixed in order to assess Design Thinker, showing examples of application and principal consequences. The research continues by providing the main pillars, so to apply the Design Thinking approach to education. The second chapter continues with the testimony of Martin Roger, who points out the importance of business at university to implement Design Thinking, especially if we want to give students the skills that the world of work currently requires. At the end of the chapter, an example of the application of Design Thinking in K-12 education is shown, with the consequent opinion of the professors regarding their experience. In the third chapter, the Active Learning Lab, a course of my thesis, is illustrated. The course is described in the whole, specifying both the credentials required for the participants to access and the structure of the lab, with the main teaching methodologies used, among which: Design Thinking, Business Model Canvas and Lean Start Up.

In the last chapter, in order to understand the effects of this course on the participants, I conducted a qualitative research using the interview as a tool. A sample of twenty-two former Active Learning Lab participants from different Master's Degrees have been interviewed. The interviews were then analysed with the aim of detecting what the effects of the lab were, in several thematic areas: work, behavior, and the attitudes of participants towards humanistic studies.

1. Design Thinking

During the history, design thinking has been coined in several ways and different definitions have been given to this model. A *methodology* for Grots and Pratschke, as they claimed in 2009, a *culture* according to Ulrich Weinberg, professor from D.School and a *philosophy* for Barry Katz, the first person invited to join IDEO as a Fellow[1].

Nowadays, Design thinking is defined by Tim Brown, CEO of IDEO, "*A human-cantered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."* The first chapter of this dissertation aims primarily at focusing on the meaning of "design thinking". This word was defined with a particular emphasis on the background in the past and, over the years, it has changed its meaning. In this regard, Arnold and Buchanan were the first to adopt this term and explore the hub of this methodology focused on empathy, creativity and the human-centred approach. In this thesis, it will be also shown that design thinking is used for the purpose of problem-solving by following the different stages of this process. There have been several fields of application since its establishment as a problem-solving methodology. Today, it is widely adopted by companies such as P&G Airbnb and IDEO, as well as in the education sector.

[1] IDEO, *"Hello, I'm Barry Kratz"* retrieved from: https://www.ideo.com/people/barry-katz

1.1 Design definition

The term *design* is such a concept a hard mission due to the fact that it is constantly in evolution. In 1992, Buchannan[2] himself asserted that "*Design is not a history made by object but an evolution of opinion around which could be defines a design object*[3]". The etymology of design goes back to the Latin *de* + *signature* which means making something, distinguishing it by a sign, giving it a significance, designating its relation to the other things, owners, users, or gods. Based on this original meaning, one could say: Design is making sense of things.[4]

The starting point of design has been provided by Simon in the text *The Sciences of the Artificial,* in which he defines design as the development of artefacts in 'order to reach a specific goal by changing existing situation into preferred one through artefacts. Artefacts for Simon are a set of: functions, components and architecture that should perform in a specific context, in other words it is something made by human that can, or not, imitate the natural environment.

Today, the definition of design is completely different, indeed according to a study made by Makno Consulting[5] in 2006, it has been shown that most of educated and sophisticated people associate the word design with the word beautiful, not looking at the functionality of the product but at its shape. With the passing of time, designers opposed from the dominance of shape on function; to this regard, Luis Sullivan a famous American architecture, said that "the shape follows the function". The same line of thought was also followed by Ludwig Mies van der Rohe, a German-American architecture, who affirmed that "Less is more". In this context, we should not underestimate that also important firms, like Apple, have given a great importance to the aesthetic value following the thought of Raymond Loewy, one of the founders of the *styling movement*, who firmly believed that "*Bad thinks do not sell"*.

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[2] Richard Buchanan is a professor of management, design and information system in Weathrhead School of Management. He published several important articles and books on design. His most important article was "Wicked Problem in Design Thinking" published in 1992.

[3] Buchanan, R. Wicked problems in design thinking, 1992

[4] Klaus Krippendorff, "On the Essential Contexts of Artefacts or on the Proposition that 'Design is Making Sense (of Things),'" Design Issues 5, no. 2 (1989): 9–38.

The word “design” is contradicted by one of its aims, that is to plan and innovate products, when combined with the word “beauty”. This contradiction is due to the fact that new things do not fall into the lenient standards but create new ones. Instead people think a beautiful thing according to aesthetic standards assimilated in the past. This term, has been produced by Thomas Maldonado and adopted by ICISID (*International Council of Societies of Industrial Design*): “*Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the central factor of innovative humanization of technologies and the crucial factor of cultural and economic exchange*[6]”. Indeed, it is possible to affirm that design embraces the different applications which go from the field of strategy, to business and management. A similar definition was explicated ten years before by H.Simon in the *Sciences of Artificial*, in which he defined Design as follows: “*Everyone designs who devises courses of action aimed at changing existing situations into preferred ones*.”

The definition of design should be divided in two dimensions: one referred to the meaning and the other one to the operation. The first-mentioned has been described by Krippendorff[7], who attributed to the word *design* the meaning users give to a product, by taking into consideration the relationship with the surrounding environment. The latter, which has been given by Maldonado, was referred to the functional aspect of design thinking : “*To design the form means to coordinate, integrate and articulate all those factors that one way or another participate in the constitutional process of the form of a product. More precisely, it refers to factors regarding use, enjoyment and individual or social product consumption (functional, symbolic, cultural factors) and those related to production (technical-economic, technical-constructive, technical–systemic, technical-productive, technical-distributive)*.” (Maldonado, 1999).

The introduction above, makes the point that, with the passing of time, a considerable number of definitions have been erroneously attributed to this vast and complex subject. What it is possible to draw up is that all these definitions only emptied its meaning and weakened its potential rather than enrich them.

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[6] Retrieved from: Maldonado T. “Disegno industriale: un riesame”, Feltrinelli, Milano, 1991

[7] Klaus Krippendorff is a professor in Annemberg School for Communication in the University of Pennsylvania. He researches the role of language and dialogue in the social construction of reality.

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1.2 Design Thinking roadmap

Today, design thinking is a discipline which serves to overcome business challenges, its building blocks stem from the literature of the last century which laid the foundations of what this subject is now. The beginning of design history dates back to 1950 with John Arnold, during Creative Engineering seminars at Stanford University. The work made by Arnold started with the theory of the creative mildest in Creative Engineering in which he defined what creativity is as well as the factors that improve the ability to be creative so that eventually the definition of creativity is meant like a driver towards innovation. Arnold based his theory on the four-analytic factors of creativity made by Joy Paul Guilford, by redefining them as follows:

- **Problem sensitivity**: “Deep spirit of inquiry, of questioning” (CE, p. 63) who look for to “improve the things he sees”
- **Fluency**: is the number of ideas a person produces per unite time
- **Flexibility**: "Refers to the number of meta-options a person considers per unit time.“
- **Originality**: is the person who “Brings together ‘seemingly disparate’ or ‘habitually incompatible’ ideas or objects […] to form tenable and useful new combinations”

In his study, Arnold adds other three factors: daring, the enthusiasm with which one pursues his/her work, and the creative confidence. In his opinion, creating can also implicate destroying, because people who want to find innovative and adequate solutions should firstly destroy a present possible one. To this regard, Edison affirms that *“Invention is two percent inspiration and ninety-eight percent perspiration”*[8].

Creative confidence is one of the pillars of Design Thinking; in this regard, Arnold affirms that only thanks to confidence, one can undertake an innovative process

8 Retrieved from http://thisisdesignthinking.net/2017/05/theoretical-foundations-of-design-thinking-john-arnold-creative-thinking-theories/

through which it is possible to destroy a good and workable idea with the aim to find an extraordinary one.

Arnold was the first person to introduce the concept of Design Thinking in the sense that *"People intentionally develop and invent things and design solutions"*; anyhow, according to him, there are two kinds of design thinking: on a hand a design thinking that looks to a disruptive innovation and on the other hand a design thinking that is necessary for an incremental one. It is thanks to Arnold if we have today the opportunity to build up the main pillars of design thinking.

In order to understand the design thinking model, it is necessary to analyze the evolution of its methods and processes during the history. After the Second World War, the first "Conference on Design Methods" was held In 1962. Following this crucial event, the first book about creativity by Osborn and Gordon has been published. During this period, three influential academics: Herbert Simon, Horst Rittel and Victor expressed their opinions about design. For this reason, they decided to develop a different definition of it, which has contributed to shape the current Design Thinking model. According to them, the starting point of design thinking is deeply rooted in 1969, when, thanks to Simon and his text entitled *Creation of artefacts,* some fundamental aspects of design thinking have been developed. In this text, Simon declared that human beings have designed the world through artificial things in order to reach a favorable condition, but this transformation, from an existing condition to a preferred one, required an adaptation with the environment. Simon explained this adaptation with the likeness of the ant that: when it comes back home, it adapts itself to the surrounding environment without having a global overview. A designer faces the same situation when he/she meets a problem, so in order to reach the predicate goal, he/she should take a better decision even if not the best one. Regardless of this, what problem solving leads us to do is taking a decision in the right moment when it is necessary to find a solution, not matter if it is the best one. After all, we are human beings and we all have our limits just like computers. On this subject, Simon wrote a whole chapter about the relationship between men and computers, by taking into consideration two perspectives: who we are and who our stakeholders are. Simon can be considered the first who introduced the concept of Design Thinking in literature and who defined a model composed by seven steps to undertake a design process which continues to be a milestone of design thinking.

Another crucial contribution to design has been given by Horst Rittel in 1960, when he coined *"wicked problem".* The latter consists in a problem that: *"Is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize[9]".* Rittel furthermore explicated that wicked-problems approach makes arise the concept of *Indeterminacy* which *"Implies that there are no definitive condition or limits to design problems"*, for this reason designers should create something which still does not exist. He also stated that "*A part of art which deals with wicked problems is the art of being incapable to find a prematurely solution to apply*". Furthermore, according to him, Science does not have the ability to solve uncertain problems, the only weapon it has to solve them is using creativity. While *"The linear model, is based on certain design thinking problems that have defined conditions. The designer's task is to identify those condition precisely and then calculate a solution"*.

Victor Papanek introduced the concept of responsible design in the text: *"Design for the Real World: Human Ecology and Social Change"* published in 1972, in which it is treated the importance of the moral commitment of a designer. This text is considered extremely important since the moment that, for the first time, it talked about empathy, value and "Human Centered Design".

During the 80's, a great number of articles about design process have been written, such as the one of Buchanan published in 1992, entitled: *"Wicked problem in Design Thinking"* in which he defines Design Thinking not as a science but as a liberal art: *"a discipline of thinking that may be shared to some degree by all men and women in their daily lives and is, in turn, mastered by a few people who practice the discipline with distinctive insight and sometimes advance it to new areas of innovative application"[10].* This text is considered a milestone in the history of Design Thinking due to the fact that, for the first time, it has been associated with the concept of *innovation*. Moreover, Buchanan resumed the concept of Rittel about "wicked problem", affirming that design problems are "indeterminate" and "wicked". *"The subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience. But in the process of application, the designer must discover or*

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[9] https://en.wikipedia.org/wiki/Wicked_problem

[10] Buchanan, R. Wicked problems in design thinking,1992

invent a particular subject out of the problems and issues of specific circumstances" this shows that design thinking can be applied to different fields.

In the same period, other two authors Nigel Cross[11] and Donald Schön[12], declared that Design is an art completely different from disciplines, above all science. Nigel Cross in his article affirmed that "*We have come to realize that we do not have to turn design into an imitation of science, nor do we have to treat design as a mysterious, ineffable art. We recognize that design has its own distinct intellectual culture; its own designedly 'things to know, ways of knowing them, and ways of finding out about them"* (Cross 1999, p. 7). Donald Schön, published "The Reflective Practitioner" in which he defines design "*as a unique practice through cognitive reflections and explanations on its process*". The kernel of the idea of Schön is that design practice should focus on its framework and its environment, in other words on the idea of "problem setting" which facilitates designers to understand the issue before starting the process of production. In this regard, Schön replied that *"When ends are fixed and clear, then the decision to act can present itself as an instrumental problem. But when ends are confused and conflicting, there is yet no 'problem' to solve".* However, a confused, conflicting problem and whose solution appears clear is a so called wicked problem, named "Swampy lowlands".

In the early 1990s, design was analysed from the point of view of management, to the point that it became a useful tool to develop management innovation. Boland[13] and Collopy[14] tried to explain the positive effect of a design attitude through these words: *"A design attitude views each project as an opportunity to question basic assumptions, a resolve to leave the world a better place. Designers relish the lack of predetermined outcomes, the opportunity to go back to those assumptions that have become invisible and unnoticed, looking for the real thing we are trying to accomplish, unvarnished by years of organizational habit. A design attitude fosters a problem-solving process that*

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[11] Nigel Cross is both an educator and a researcher. He is one of the founder of Design Research Society.

[12] Donald Schön is a professor and philosopher in the Massachusetts Institutes of Technologies. He developed the concept of reflective practice.

[13] Richard Boland, Jr is Professor of Information Systems and Professor of Accountancy at the Weatherhead School of Management,

[14] Fred Collopy is a professor of Design and Innovation in Weathrhead School of Management. He has spent many years of his academic research in the application of design to organizational innovation.

remains liquid and open, celebrating path-creating ideas about new ways to use technology and new work processes (ibid., pp.9-10)"[15]. If managers adopt this type of approach, they would approach to problems with a deeper sensibility which would influence and energize design for products and services.

In 1991, in Palo Alto, California, a global design and innovation company was found, its name is IDEO and it is the result of the merger of three firms of industrial Design. The core competence of the firm is Design Thinking to solve complex issues generating innovate ideas. Tim Brown, the CEO of IDEO, affirmed that: *"Design thinking can be described as a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity*[16]*".* With this definition, Tim Brown wanted to underline the importance of a model strongly oriented towards the *Human-centered* approach whereby, first of all, customers must be satisfied. Nowadays, according to Forbes[17], IDEO is the most important design firm in the world, thanks to its global innovative impact.

Design thinking approach is evolving very fast and an ever increasing number of firms decide every day to adopt it to give birth to innovative ideas. That explains the increase in work-shops and conferences organized throughout the world and papers written about this extraordinary method. All these factors, lead design thinking to become a real trend. This is the reason why from 2014 to 2017 researches on google have exponentially increased [data are reported in the scheme below] since the point that it started to be adopted not only by firms but also by schools, including North America and North Europe.

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[15] Richard J. Boland, JR. and Fred Collopy, Managing as Designing, 2004

[16] Retrieved from: https://designthinking.ideo.com/?p=49

[17] Is a US magazine of economics and finance founded in 1917 by Bertie Charles Forbes. Retrieved from https://www.forbes.com/sites/sap/2015/05/10/what-is-design-thinking/#12dd9232471f

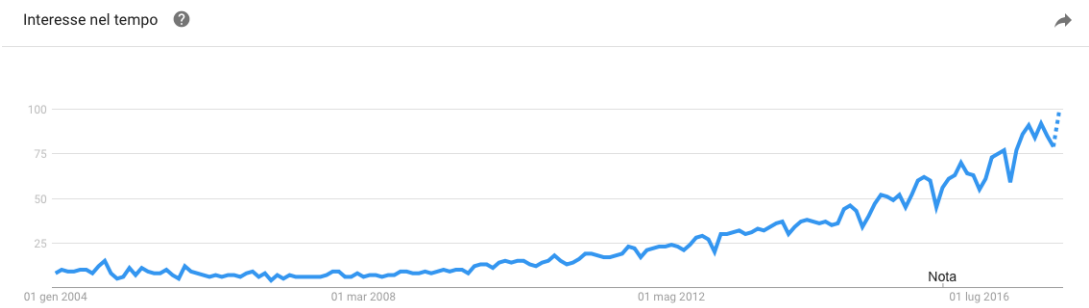

Figure 1 The Design Thinking trend in the last twelve years. Retrieved from Google Trends

Thanks to another study, it is has been possible to build a map of the countries worldwide which adopt Design Thinking. They are represented in the scheme below.

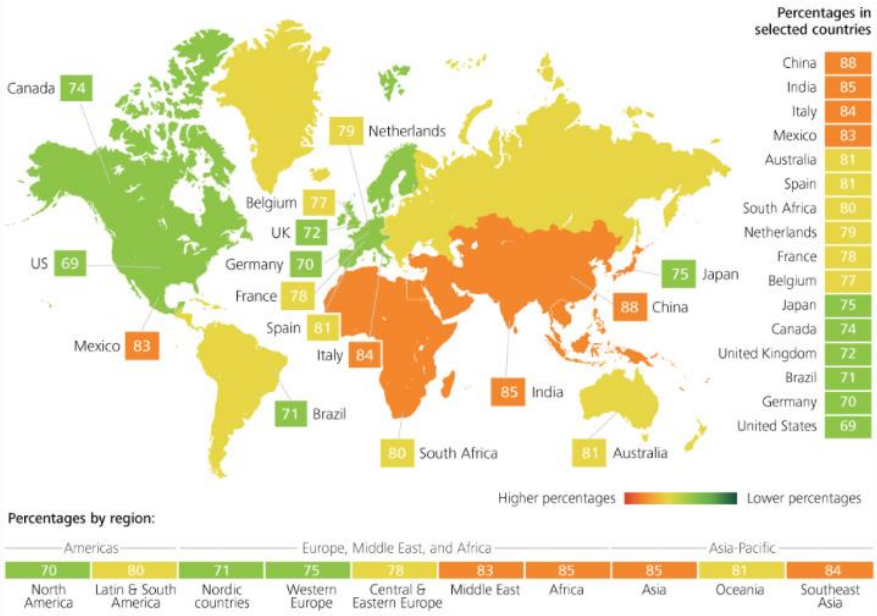

Figure 2 Design Thinking: Percentage of respondents rating this trend "important" or "very important". Retrieved from Deloitte University Press

1.3 Design Thinking and its features

Design Thinking is a structured approach to generate and develop innovative solutions. Tim Brown, about design thinking, declared: *“Design thinking is all about upgrading within constraints."* Design Thinking *“Is a process—applicable to all walks of life—of creating new and innovative ideas and solving problems. It is not limited to a specific industry or area of expertise[18]”.* It can be applied to different fields of work: from technology to education and the area of public service.

David Kelley, the co-founder of IDEO and one of the father of design thinking, in a famous American show called *60 Minutes*, has released an interview in which he talks about design thinking saying: *“Be empathetic... Try to understand what people really value. The big thing about design thinking is it allows people to build on the ideas of others. Instead of just having that one thread. You think about it, I come up with an idea, and then somebody from somewhere else says, ‘Oh that makes me think we should do this and then we could do that.’ And then you get to a place that you just can’t get to in one mind.”*

With this statement, Kelley explicated the mains features of design thinking and design thinkers: human-centred approach; Collaboration, Multidisciplinary, Creativity and the propensity to wild ideas that allow you to go beyond the limits of knowledge.

1.3.1 Design Thinking perspective

In the previous paragraph, it the term *Human centred approach* has been introduced, with the meaning of a deep understanding of human behaviour in its environment in order to identify human needs. Since design thinking is strictly related to the human sphere, an important tool has been developed to improve the field of research, which is called *ethnographic*. To be more specific, Human-Centred is a Design process that focuses on the needs and expectations of the person through the use of techniques that translate current contexts systemically. In 1968, Norman & Draper reiterated this concept and applied it to a totally different field, the technological one, theorizing that *"The final design is a collaborative effort among many different*

18 Retrieved from https://blog.ted.com/david-kelley-of-ideo-talks-design-thinking-on-60-minutes/

disciplines, trading off the virtues and deficits of many different design approaches but user-centred design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming[19]." The human-centred approach is a peculiar characteristic of Design Thinking; indeed, design Thinking starts from users' insight, the observation of human behaviour and human needs in order to generate an idea able to cover an unmet need. This is the reason why Design Thinkers became a sort of social researchers. A characteristic that a design thinker should have in order to guess the latent needs is empathy. Brown suggests that a Designer Thinker should stay out of his office in order to get know people in depth, understand what and how they think, and try to look at the world from their perspective.

Design thinking perspective can be resumed in the graph below, in which the double function of designers is explicated as follows: observing and understanding the latent human needs of people turning them into a business solution for the firm. On the other hand, Designers should be able to understand the inner dynamics of socio cultural models and observing the invisible things of everyday life. Indeed, they are also defined brokers of knowledge.

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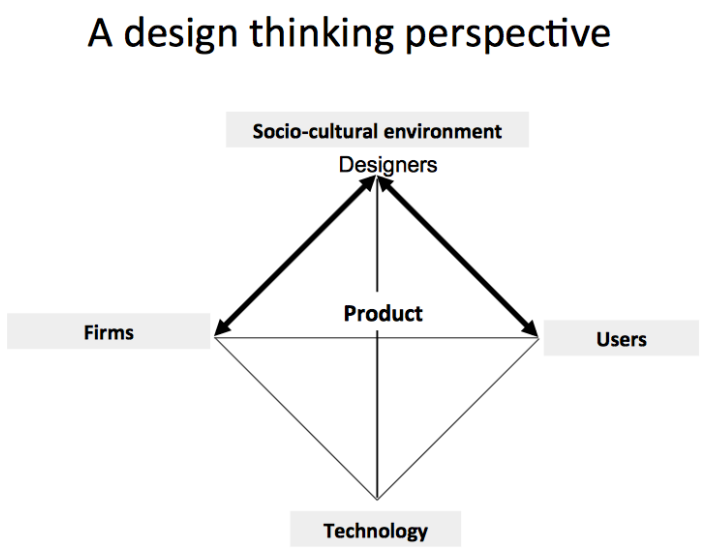

Figure 3 A Design Thinking perspective. Retrieved from Calcagno, 2013

[19] Retrieved from http://www.ariannasalvetti.com/tag/design-thinking/

A completely different approach from this one is Design-Driven Innovation. In this regard, Verganti[20] quotes that "*Design is making sense of things*", in terms of dealing with the meaning people give to products, messages and product languages that one can devise to convey that meaning.

Design driven-innovation is not a user-centred approach. It proposes an innovation that radically redefine what a product means for a customer; indeed design-driven does not satisfy a need but it grabs a wish. Designers give a meaning to products by using a domain-specific language and a set of signs, symbols or icons, that can deliver a message. This type of approach is applied by a lot of Italian manufacture firms such as: Alessi, Kartell and Artemide.

According to this approach, Verganti listed three types of "innovations":

- **Market-Pull Innovation:** it starts from the analysis of users' needs. It does not present radical innovations because human beings are not able to go beyond what they really mean or new technological opportunity.
- **Technological-Push Innovation:** it consists in a result of dynamics of technological research, and it is inclined towards the creation of a more radical type of innovation
- **Design-Driven Innovation:** it starts from the comprehension of subtle and unspoken dynamics in sociocultural models and results in radically proposing new meanings and languages which often imply a change in socio cultural regimes.

[20] Roberto Verganti is ordinary Professor at the Department of Management Engineering of the Politecnico of Milan. At the same time, he conducts research in the field of innovation management, with particular reference to product innovation and research policies. He has written several books of which the most important is Design-Driven Innovation - Changing the Rules of Competition by Radically Innovating What Things Mean Published by Harvard Business Press, 2009.

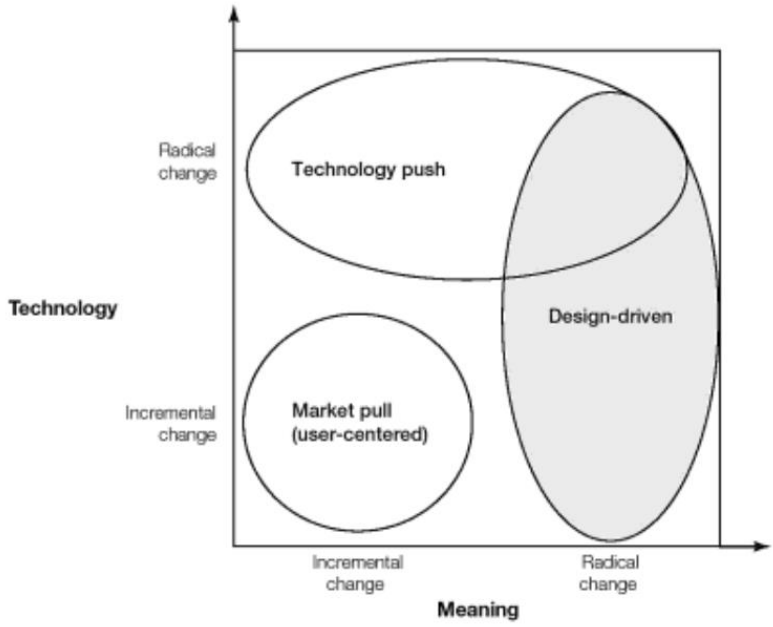

Figure 4 Technology Epiphany in Design Innovation. Retrieved from Verganti, 2008

The graph below is extremely interesting. It represents the overlap between Technology-push and Design-driven; the emerging area is called technology epiphanies. In this overlap a breakthrough technological innovation changes are often associated with radical changes in product meaning and vice-versa.

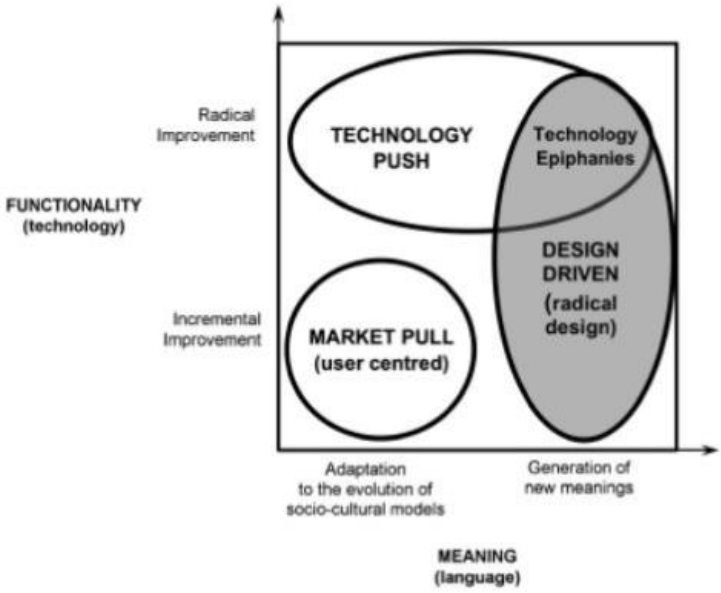

Figure 5 Innovation Strategies. Retrieved from Verganti, 2008

An example of Design- Driven innovation is Artemide, a famous Italian Design firm. In 1998, Artemide launched a new lamp called Metamorphosis, a type of lamp which radically changed the concept and the idea of a lamp. Artemide had a peculiar characteristic: its lamp generated “human light”. Indeed, it consists in a tool able to generate an atmosphere through the properties of colour and “light control” which follows the mood of the users. That’s why a user would buy this lamp: not because it has a nice style but because it generates human lights. This shows that a given meaning is achieved by using a domain-specific language. Innovation does not come from the market but thanks to the designer who reads the needs of the market.

1.4 Creativity

“Individual Creativity” is a function of our intellectual abilities, knowledge, style of thinking, personality, motivation and environment. It consists in facing a problem in an unconventional way, convincing others that my idea is profitable, if it is valid. Creativity increases if a person is really interested in a subject and if there is a good environment around him/her.

Creativity is considered, by Tom[21] and David[22] Kelley, essential to success in any discipline and industries and it allows a continuous and successful growth. The world is not divided into creative and no-creative people provided that: “Creativity is something you practice, not just a talent you were born with.” In the impressionistic era, creativity was conceived as a flash idea (it means as a good idea elaborated only in few seconds) to be translated into wonderful concrete projects. However, nowadays, creativity is not an intellectual property but it is a consequence of a hard work, it is the result of a series of constant exercises. According to Robert W. Franken *“Human Motivation*” creativity is a “*Tendency to generate or recognize ideas, alternatives, or*

[21] Tom Kelley is the best-selling author of The Art of Innovation and The Ten Faces of Innovation, as well as a partner at the renowned design and innovation consultancy IDEO.

[22] David Kelley is the founder of IDEO, he designed a lot of icons of digital world as the first mouse of Apple. He has also won the Edison Achievement Award for Innovation, as well as the Chrysler Design Award and National Design Award in Product Design from the Smithsonian's Cooper-Hewitt National Design Museum

possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others[23]".

It is not possible to find a unique definition of creativity, since it does not exist in a specific field of application (art, economic, engineering, music...) to which it can be associated. Every person should be creative even though it is the result of a continuous process of exercise and practise. And since creativity is considered the fruit of a practicing process, the two Kelley brothers affirmed that in IDEO they don't teach creativity but they help people to rediscover their creative confidence and their natural ability, so that they can come up with new ideas. Tom and David Kelley suggested four fears to avoid to be creative:

1. *Fear of the unknown messy:* "Creative Thinking in business begins with having empathy with your customer". That's why one can't remain behind the desk but one should get out from the comfort zone to explore the mess. Only in this way, it is possible to find insight and creative breakthroughs.
2. *Fear of being judged*: Many times, we find ourselves killing our creative thinking because we think our idea is bad and misjudged, so we prefer safe solutions and suggestions. We should *"Listen our intuition and embrace more of your ideas*".
3. *Fear of the 1st step:* one should not waste a lot of time planning. There is a moment when one should take action and starting to develop new ideas.
4. *Fear of losing control:* working in team can help people not to lose control

In order to generate creative ideas, a factor which can influence the creative process is the environment. It has been proved that, a safe and peaceful workplace can have a great impact on the developing of creative ideas. Only in this way, it is possible to build a sentiment of trust which can help people to run creative risks. During a TED talk, Tim Brow, in accordance with IDEO, explained how it is possible to link creativity to the world of games, affirming that when we play we do not create limits, we embrace all the incitements from the outside.

23 Retrieved from: https://www.csun.edu/~vcpsy00h/creativity/define.htm

Design Thinking expects collaborations between the members of a team, it does not accept competitive people. This is the reason why a team should be composed by members coming from different fields of study (multidisciplinary fields) so that a problem can be analysed from different perspectives. It is true that, in a diversified team, the sentiment of trust can be compromised if not all the members have clear in mind what their objectives are. Anyhow, through a process of team-building and mutual trust, it is possible to achieve creative solutions. According to Tom Kelly, a team should be composed by refers to these personas as the ten faces of innovation: anthropologists, experimenters, cross-pollinators, hurdlers, collaborators, a director, experience architects, a set designer, caregivers and storytellers. Each person has a specific role and function inside the team as we can see in the figure (6). For instance, a set designer, a director, and a collaborator have the aim to guide and bring the team together; an anthropologist and a caregiver should observe and understand human needs, an experience architect, a hurdler, a cross-pollinator are necessary in the phase of ideation; an experimenter is fundamental to test with trial and error a prototype. Finally, a storyteller has the role to communicate the results to the company and its stakeholders. In each team there are people who are closely related to this personas and it is important that each member should find its role inside the team; to make it possible, the team must be collaborative and multidisciplinary.

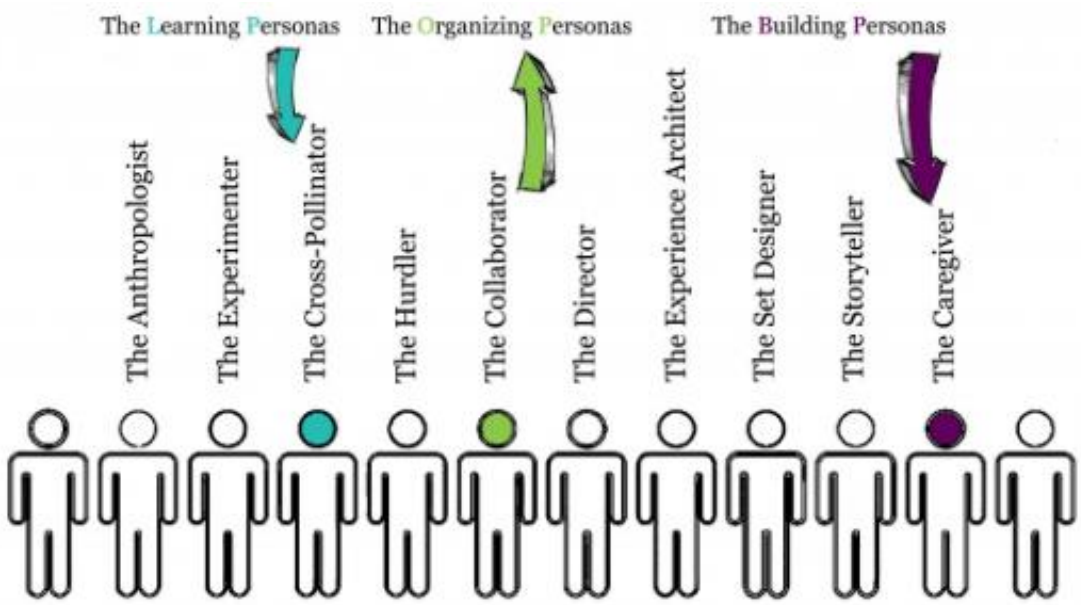

Figure 6 Ten faces of Innovation. Retrieved from http://www.narrativecommunications.com/blog/page/3/

According to Tim Brown: collaboration, multidisciplinary and creativity are closely connected. In this regard, he defines that the importance of collaboration is due to the fact that both products, services and experiences are very complex. For this reason, design thinkers need to work with colleagues from different disciplines and experiences. In IDEO, they employ resources coming from different fields: engineers and marketers, anthropologists and industrial designers, architects and psychologists. This multidisciplinary context leads to a disuse of the myth of the lone creative genius. In the same text, Brown lists other four characteristics that a designer thinker should have:

1. **Empathy**: it means considering the world as a result of men's perspectives who play different roles in the society. When a design thinker approaches to someone, he/she can imagine what that person desires or needs.
2. **Integrative thinking**: It is the ability to undertake analytical processes, detecting all the crucial aspects of a co-founding problem and creating alternative solutions.
3. **Optimism**: Designer Thinkers do not matter how hard is finding a solution for a problem, they know that even only a solution is better than other existing alternatives.
4. **Experimentalism**: Designer Thinkers can proceed in new directions thanks to their capacity to explore constrains in a completely creative manner.

One of the most famous design thinkers was Thomas Edison, the creator of the electric light bulb. His creative power resided in his ability to understand human needs, by asking himself how people would have used what he had ideated. He did not just focus on this, he also created a R&D lab surrounded by the best scientists and introduced the idea of the *team* to facilitate the process of innovation. Edison has succeeded in combining art, science, market analysis and economy and has unconsciously revealed one of the first examples of design thinking.

1.5 Framework and rules

Today, in order to face environmental and society changes, an innovative approach, also adopted by firms, able to create breakthrough ideas, is necessary. A solution to these problems is Design Thinking which can frame the project with a systemic approach, based on what is functionally possible within the foreseeable future (feasibility), sustainability of the economic model (viability) and utility and validity of the person (desirability).

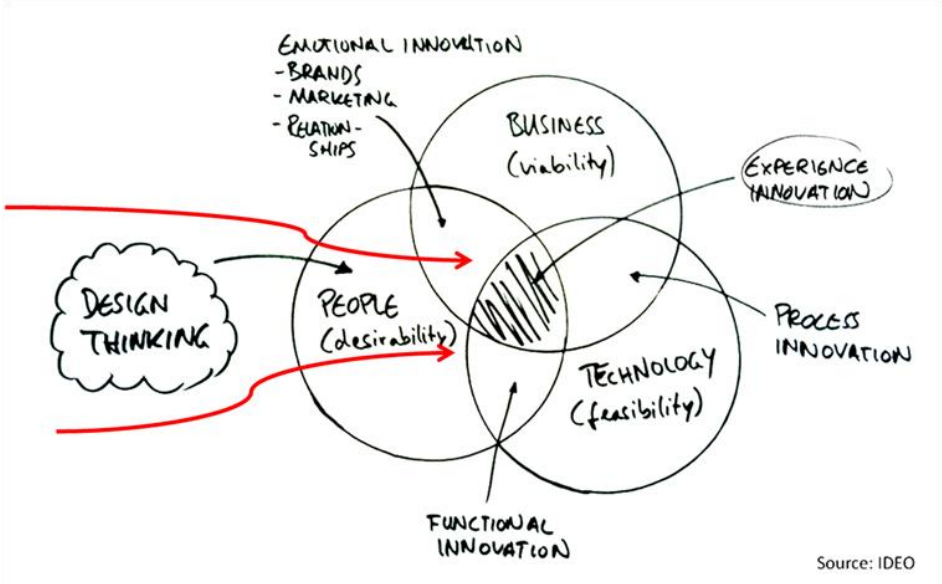

Figure 7 Illustration of Thinking Design. Retrieved from http://designthinking.ideo.com/?p=776

This model comes from the definition made by Tim Brow about Design Thinking: *"A human-cantered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success*[24]*".* In this regard, the core value of Design Thinking process resides in the intersection between these three areas whereas the classic designer, that is the "modern" design thinker, will be in a position of balanced equilibrium.

A project can be driven from a disproportionately budget, technology or other; and a different organization can try to put in the front row. *"Design teams will cycle back*

[24] Retrieved from: https://www.ideou.com/pages/design-thinking

through all three considerations throughout the life of a project, but the emphasis on basic human needs - as distinct from fleeting or artificially manipulated desires - is what drives design thinking to depart from the status quo" (Tim Brown 2009). Furthermore Design Thinking can identify a human behaviour and convert it into both customer benefits and business value which lead to break up the consumer's latent needs in demand.

According to HPI-Stanford Design Thinking Research Program, financed by Hasso Plattner foundation, four different rules of Design Thinking have been established:

- **Human right**: All design activities are basically social in order to solve technical problem with the aim to satisfy human needs and to make the manager able to understand all the human elements
- **The rule of ambiguity:** Designer should keep ambiguity. Innovation requires to explore limits of our knowledge in order to observe things without limits so that we can see as many things as possible, from different perspectives.
- **The rule of Re-Design:** Over the last millennia, human needs have never changed, what constantly change are social and economic circumstances. For this reason, it is fundamental to understand how these issues were considered in the past, to find new ways to solve them in the present. To be successful, we need to apply "far-sighted methods and instruments" to best estimate the social and technical conditions we will meet in 5, 10 or even 20 years in the future.
- **The rule of tangibility:** The power of prototypes is to communicate, as they are real media. Prototyping central concept during the entire period of research. The rule of "making tangible" is one of the most important discoveries of the Design Thinking research program.

1.6 Process

"A human-cantered innovation process that emphasizes observation, collaboration, fast learning, visualization of ideas, rapid concept prototyping and concurrent business analysis" (Lockwood, 2009).

Design Thinking process is made up of “an overlapping of spaces” rather than a sequence of orderly steps. It is dynamic, interactive and holistic. However, it cannot be considered linear as it commonly happened in the past with Wallas (in 1926) who divided this creative process in four stages: preparation, incubation, illumination and verification. This classification consists in the starting point of a research on creativity in the field of design, a subject of study which is still evolving. In the 80’s, design methodology changed and it passed from an analytic and rational approach to a holistic one. In this period, thanks to Problem Solving, the process of design was described as a “Reflective Practice” and a Co-Evolution of spaces: problem-solution (Dorst & Cross 2001).

Design Thinking includes different models, the most important ones are:

- **Model of “3 I”** (inspiration, ideation and implementation) has been developed by IDEO and it is considered the most important design thinking model.
- **HDC Model** (Hear, Create and Delivering), always designed by IDEO, is a response to a request from the Bill & Melinda Gates Foundation. IDEO developed another design thinking model as a toolkit for non-governmental organizations and companies working with poor communities in developing countries.

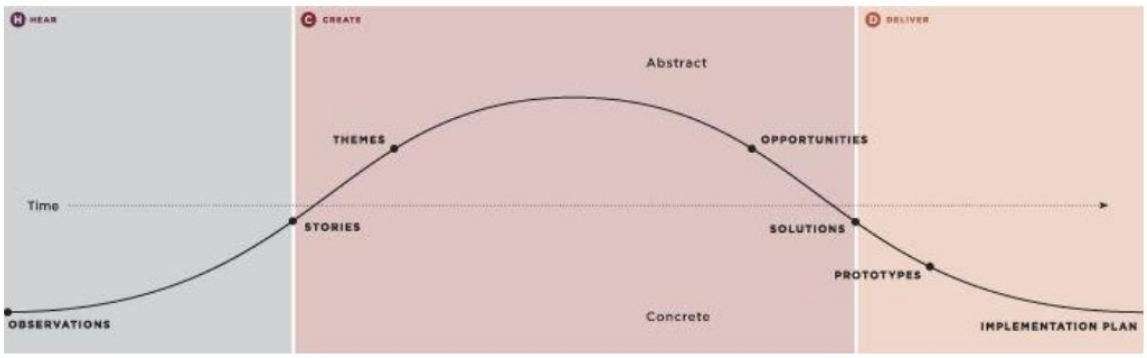

Figure 8 HDC Model. Retrieved from http://www.startcupveneto.it/ReusableItems/Documents/II%20Design%20Thinking_Storia,%20Modelli%20e%20Strumenti.pdf

- **D.School Model**, made by Hasso-Plattner Institute of Potsdam University, composed by
  six steps: Understand, Observe, Point of View, Ideate, Prototype and Test
- **Stanford Design Thinking Model** which emphasizes empathy as a systematic approach, is characterized by five stages: empathize, define, ideate, prototype and test; through which it is possible to realize one's own ideas and achieve success.

1.6.1 The Model of "3 I"

The model of "3 I" has been developed by the Californian based firm IDEO for social purposes. According to this approach, design thinking involves innate abilities, which are often ignored by the majority of human beings. It is based on intuition, the development of ideas including an emotional and functional meaning and the ability to express one's point of view not merely using words and symbols. To this regard, there are three spaces to keep in mind: *inspiration, ideation, and implementation.* The word "spaces" instead of "stages" is given because during a design process carried out by a team, they are not followed sequentially, due to the fact that ideas can be always refined and they can explore new directions. Nevertheless, even if designers do not proceed by respecting the order of these spaces, it is generally indicated that the design process begins with the Inspiration space.

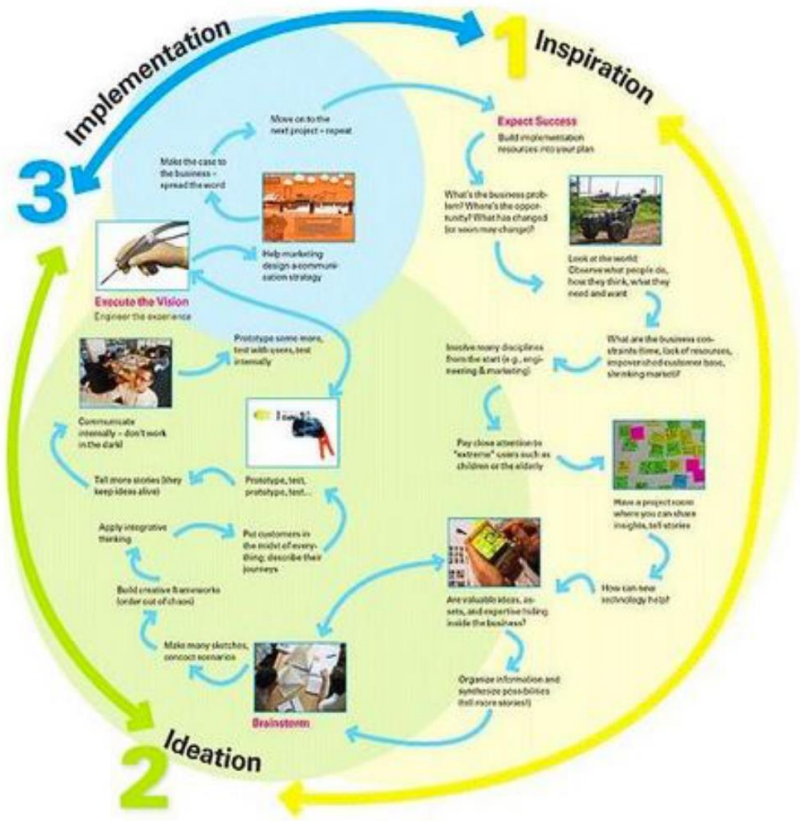

Figure 9 Model of "3 I". Retrieved from Harvard Business Review, Tim Brown, Design Thinking, June 2008

Inspiration is the moment when a challenge is given and the designer thinker finds himself observing and understanding how he/she can start the design thinking process, conduct an interview and stay human-centered. Generally speaking, the starting point of inspiration is the *brief* consisting in a set of mental constraints that gives the project team a framework from which to begin, benchmarks by which they can measure progress, and a set of objectives to be realized—such as price point, available technology, and market segment.[25] However, it possible to affirm that the *brief* does not consist in a set of instructions but it is creative process from which the most remarkable ideas emerge. Once the brief is constructed, it is necessary to take into consideration people's point of view and their needs. How? In most cases, simply asking them what they want. A designer thinker should be an explorer, a curios traveler projected toward the world with the aim to observe, to detect and to report community's experiences through their daily lives. For this reason, he is a bridge builder between

[25] Stanford Social Innovation Review by Tim Brown and Jocelyn Wyatt, retrieved from: https://ssir.org/articles/entry/design_thinking_for_social_innovation

the design thinking team and its partners which play the role of interpreters and cultural guides, extremely important to enhance credibility and to ensure understanding.

Ideation is the second space of design thinking process and consists of synthesis' process which leads to the creation of solutions and other opportunities to change. Basically, designer thinker should decode and interpret what he/she had learned during the inspiration space and how he/she can turn insights into concrete ideas and, eventually, to the development of prototypes. Basically, ideation is the moment when innovative ideas are implemented to provide new solutions many people did not know they had. As Linus Pauling, scientist and two-time Nobel Prize winner, put it, "*To have a good idea you must first have lots of ideas.*"[26] It is evident that elaborating a big quantity of ideas means having more choices and, as a consequence, making life more difficult, particularly for those who control budgets and monitor timelines. This is the reason why many organizations prefer working with less choices in favor of the incremental even if this conservative approach does not work in a long-term perspective.

The space of ideation supports the divergent thinking, which stems from a diversified team of people who, only together, can develop creative ideas and innovative projects. Architects, psychologists, artists and engineers can move freely in the process of design thinking, also thanks to their expertise in different fields and the ability to build up collaborations across these disciplines. Indeed, diversity is a strength to achieve successful outcomes.

Interdisciplinary teams typically move into a structured brainstorming process.[27] The team elaborates a big quantity of ideas, no matter how concrete or imaginary they are. The most important thing for them is to come out and to be captured as precious components for the elaboration of a project. They are commonly written on Post-it notes which can be shared with the other members of the group. If complex ideas emerge, it is of vital importance to visually represent their concepts so that everyone can understand and encourage the others to express themselves freely. Indeed, one rule during the brainstorming process is not judge divergent thinking and discourage those who impose themselves on the others by dominating the group. For this reason,

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[26] Ibidem

[27] Ibidem

an environment where everyone feels comfortable to bring out as many ideas as possible is essential. This leads the group to undertake a process of grouping and sorting ideas so that the best rise to the top whereas the bad ones are discarded. After filtering ideas, field-testing them and taking them to market it is possible to proceed to the implementation space.

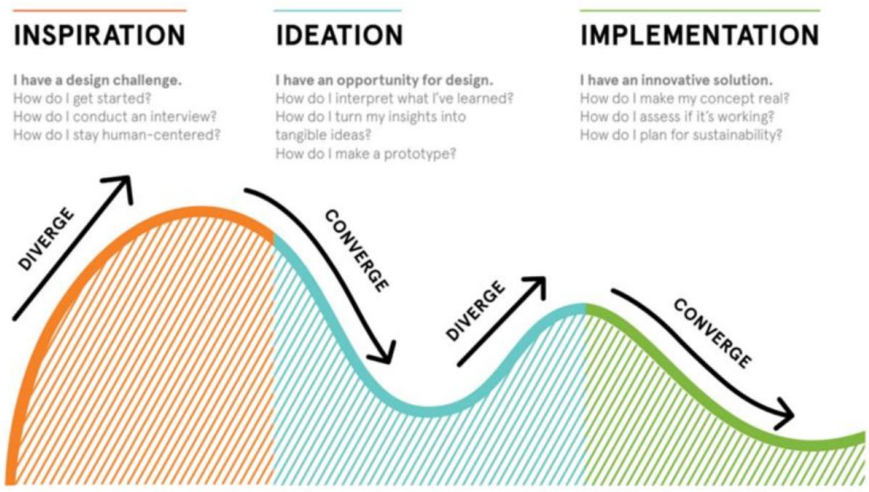

Figure 10 IDEO model. Retrieved from
https://cdn.evbuc.com/eventlogos/160332149/designthinkingphases.png

Implementation is the last space of design thinking process, when the best ideas, filtered in the space of ideation, are finally turned into concrete action plans. Design thinkers must now find a way to prototype, turn ideas into actual products, test them, iterate and refine them. A delicate stage is that of prototyping. Indeed, in this moment, design thinkers face unforeseen implementation challenges with the aim to achieve a reliable long-term success. Prototyping is particularly vital for developing countries where the lack of infrastructures, retail chains literacy and communication networks make new products and services hard to develop. Once the products and services are created, the prototyping process can leave space to the communication strategy, which particularly pass through storytelling and multimedia, so that the organization can get in touch with a set of stakeholders.

An example that should be taken into consideration in order to have a concrete idea of how prototyping can be a critical and crucial step in implementation, is VisionSpring, a low-cost eye care provider in India. Its aim was to provide comprehensive eye care to children, rather than only sell reading glasses for adults. In their design thinking

process, they decided to carry out marketing “eye-camps” and build up self-help groups to training teachers about the importance of eye care. Working with VisionSpring, IDEO designers prototyped the eye-screening process with a group of 15 children between the ages of 8 and 12. They tried to do that through traditional tests but the young girl interviewed started to cry. In order to escape from that stressful situation, designers convened that a possible way to create a comfortable environment was inverting the role teacher-student, by proposing them to screen their teacher. They respected the role and they played doctor together. *IDEO “Was able to design a system for the eye screenings that worked for VisionSpring’s practitioners, teachers, and children. As of September 2009, VisionSpring had conducted in India 10 eye camps for children, screened 3,000 children, transported 202 children to the local eye hospital, and provided glasses for the 69 children who needed them. Screening and providing glasses to kids presents many unique problems, so we turned to design thinking to provide us with an appropriate structure to develop the most appropriate marketing and distribution strategy[28]”,* explained Peter Eliassen, vice president of sales and operations at VisionSpring.

1.7 Design Thinking in the sphere of firm

In the previous pages, it has been explained that Design Thinking is a problem-solving approach than can be applied to different fields, even if the main application is within firms. Design Thinking in firms has the aim to create innovative solutions and activities. Let’s take into consideration some “case history” of design thinking in firms.

1.7.1 P&G

Procter & Gamble is an historical company funded in 1837. In 2011, it has been inserted in the fifth place of Fortune Magazine, as one of the most admired companies in the world. In 2001 in order to eliminate business gaps and to improve customer

[28] Retrieved from: https://ssir.org/articles/entry/design_thinking_for_social_innovation

relationship, the CEO of the company A.G. Lafley, decided to introduce Design Thinking within the firm. Testimony of this is the interview conducted by Jeneanne Rae in 2008, in the Businessweek magazine.

Cindy Tripp, marketing director at P&G Global Design, is one of the promoters of “Design Thinking Initiative” inside the firm. Thanks to the implementation of Design Thinking, P&G built up about 40 workshops with the commitment of one hundred facilitators employed in different work areas of P&G, such as: marketing, research and development, info tech, and product supply as well as design. Workshops were not only focused on product initiatives but on strategy and retail relationship building. According to the interviewer, Cindy Tripp: *“We want people to use these techniques daily in their work—using broad insights; learning faster; failing faster. Design thinking can be applied everywhere, every day”*.

In this interview, it has been explained which is the main difference between the usually process used by P&G and Design Thinking. In P&G, it was mainly used in an analytical process, composed of several phases, which are: understanding the problem and its alternatives; developing several ideas; and undertaking the final external check with the customer. However, Design Thinking analyzes both the surrounding environment and the consumer, taking into account a very large context, the brainstorming process with its related fresh and innovative ideas; finally, it co-creates and iterates them by using low-resolution prototypes with the consumer. The CEO of P&G Lafley underlined the positive points of Design Thinking. In his book entitled "The Game-Changer", he said: “Business schools tend to focus on inductive thinking (based on directly observable facts) and deductive thinking (logic and analysis, typically based on past evidence)," he writes. "Design schools emphasize abductive thinking—imagining what could be possible. This new thinking approach helps us challenge assumed constraints and add to ideas, versus discouraging them." A good example could be the site of Olay (www.olay.com/), an important skin care line. P&G found out that Olay's website, before its upgrading, appeared extremely messy to an extent that the customer felt frustrated to buy online. Through the Design Thinking process, the company gathered consumer complaints, successively marketers presented a slimmer site and improved their connection with the online grower.

In the Olay's new site, through a relaxing voice, the user is helped to make the best possible decision. The story teller puts a number of questions to the user, such as: what are their habits? Your goals? Through user responses, the site analyzes

them and provides the user with a series of recommendations based on their age and needs. Nowadays Olayforyou.com can clearly show that it offers a credible consulting service without leaving home and at the same time it gives a wealth of specific data on both potential and current users in a personal manner. Dan Hamilton, brand manager for Olayforyou.com, said: *"The most important result is that people are finding the right solutions and sticking with them. They describe increased satisfaction and a better experience. As a result, we are seeing an increase in our equity scores and better loyalty to the brand".*

The Design Thinking initiatives were ideated by the Vice-President for Design Claudia Kotchka, who has obtained the job from the CEO of P&G Lafley to instill Design within the DNA of the firm. This task has been considered particularly difficult inasmuch it was difficult to affirm it within the company, given the fact that it was considered a tangential phenomenon because of other existing models of exemplification. In order to better understand the essence of Design Thinking, Claudia Kotchka met the most illustrious design thinkers, such as: Roger Martin, dean of the Rotman School of Management at the University of Toronto; David Kelley, founder of Stanford's D.School; And Patrick Whitney, dean of the Institute of Design at the Illinois Institute of Technology.

The first prototype workshop, concerning the hair-care business, was held in London in November 2005 and gave different results. The workshop had a particular emphasis on business and, according to what Tripp reported, the theoretical approach was replaced by an experimental one. For this reason, by undertaking a design thinking process the team must engage completely. *"We will always engage when working on a problem in our business, but not necessarily engage when working on theoretical problems. Of stimuli to get to the crux of the matter"* Tripp concludes. Moreover, the structure of the workshop was a sort of face-paced immersive experience aiming at underlying what is effectively different by using this methodology. Tripp says: *"Most of our workshop reflections suggest that the power of doing design thinking rather than just reacting to design thinking has shifted many standoffish leaders into real partners for design. Once they get it, they cannot get enough of it."* At first, the participants of the workshop were ashamed to present unprocessed prototypes, but over time they realized that less a prototype is worked and more a user is encouraged to give feedback. This happens because participants need help. In the end, Tripp declared the positive effect of Design Thinking. He thinks that Design

Thinking activates both sides of the brain, making the participants more creative and more empathic toward the condition of the P&G consumers. In conclusion, it is not only the left side of the brain, that is the analytic part, which can be used well, but both sides it. Tripp concludes that design will thrive more and more in P&G and states there is a long list of people from various departments of the company who require facilitators in design thinking.

1.7.2 Airbnb

Airbnb was founded in 2007 by Brian Chesky, Joe Gebbia e Nathan Blecharczyk in San Francisco, California. It is born as an online platform aiming at putting people in contact: from those who look for an accommodation or a room for short periods to the ones who have an extra space to rent, generally a private space. Nowadays, Airbnb is a worldwide company present in 65,000 cities throughout the world for a total of 191 countries. The infographic below show some data about Airbnb.

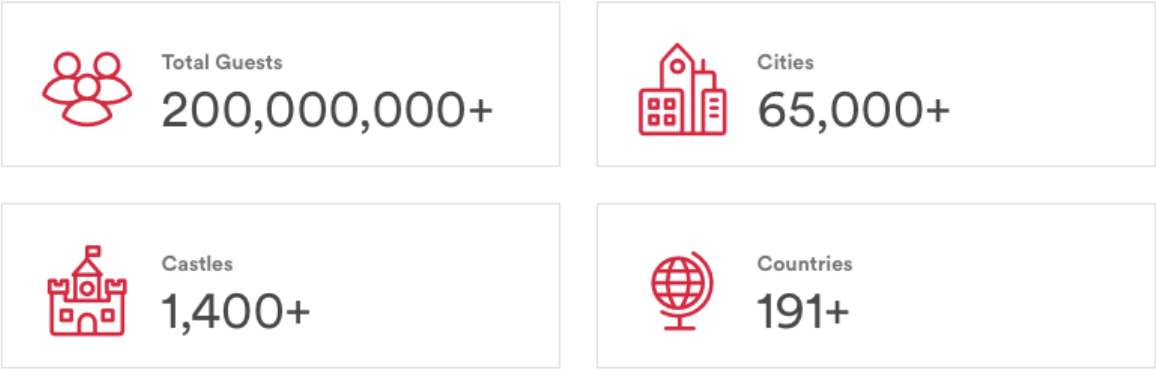

Figure 11 Airbnb profile. Retrieved from https://www.airbnb.com/about/about-us?locale=en

However, in 2009, Airbnb risked to close for bankruptcy. The fate that a lot of start-ups end up to share: it means presenting a percentage of growth equal to zero and do not find business angels given that venture investors look for companies that show hockey stick graphs, and according to co-founder Joe Gebbia, his company had a horizontal drumstick graph. One day, during a meeting in New York with Paul Graham, the team of Airbnb was trying to figure out the reasons why their company was producing so unsuccessful results and Joe Gebbia realized that the pictures which represented the apartments were pretty attractive and that potential consumers could

not understand the layout of the rooms for rent. So Graham raises the idea to travel to New York, rent a camera and spend some time with the owner of the properties as well as to replace the amateur pictures with others of beautiful high-resolution. This type of investment was not a non-scalable and no-technical solution because there was not real data in support of this theory. A week later the updating of the pictures on the platform, the result was fantastic: turnover multiplied, from $200 to $400 a week. It was the first improvement of the firm after eight months.

The turning point of the firm is that not all they could do was scalable, as Joe Gebbia said in Silicon Valley, only scalable solutions were sought so that solving the problem of a subject solves the problem even to an infinite number of people, thanks to the use of codes. The Airbnb team, for the first year, tried to solve problems through codes behind a desk following the dogma coming from Silicon Valley. The first time they abandoned this way to solve the problems, was when they met Paul Graham at Y Combinator who allowed him not only to look for scalable solutions. Joe Gebbia stated he would never forget that moment because it was a clue where the trajectory of Airbnb changed dramatically.

Computers are extremely powerful, we use them to solve most of our problems, but as Gebbia's experience showed, codes alone can't solve every problem customers have and a firm needs to use a human-centered approach in order to fight consumer problems and find intelligent solutions for them. Gebbia subsequently affirmed that attending a school of designers helps people to develop the best consumer experience and expressed the company's new core value: "*If we were working on a medical device, we would go out into the world. We would go talk with all of the stakeholders, all of the users of that product, doctors, nurses, patients and then we would have that epiphany moment where we would lay down in the bed in the hospital. We'd have the device applied to us, and we would sit there and feel exactly what it felt like to be the patient, and it was in that moment where you start to go aha, that's really uncomfortable. There's probably a better way to do this*." Indeed, nowadays after the first recruitment week, Airbnb sends his employees to visit the apartments to understand what consumer needs are and the core values of the company. Travelers are required to document their journey and then share it with the company. Airbnb started to develop new ideas with a human-centered approach, referring to some pillars of Design Thinking. In this sense, Gembia shared: *"I'm not sure how useful data is if you don't have meaningful scale to test it against. It may be misleading. The way*

that we do things is that if we have an idea for something, we now kind of build it into the culture of this idea that it is okay to do something that doesn't scale. You go be a pirate, venture into the world and get a little test nugget, and come back and tell us the story that you found". The member of individual team make small betas on news ideas and measure which is the return on beat. This structure encourages people to take responsible risks which could lead to the development of new features and to find new opportunities. Airbnb thinks that new ideas could come from every part of the company, indeed it encourages new employees to ship new features on their first day in the company. An example is when a new designer inside of the firm proposed to change the function “star” with a "heart". After the company decided to apply this change, the engagement increase by over 30% by its users. When employees proposed a new idea to Gembia, he suggests to think bigger than that and wanted his impudent to present them only when they thought their idea a hundred times bigger.

1.7.3 IDEO

“IDEO is global design company committed to creating positive impact”[29]

IDEO is a worldwide consulting firm applying a human-centered approach in order to help private and public organizations to solve big problems and to generate a creative culture, developing new products and funding new firms, branding and designing products, service, space and interactive experience. Its mission goes from firms to the field of education. The company began in 1991, thanks to three friends: David Kelley, Bill Moggridge[30] and Mike Nuttall[31], they merged their firms and founded IDEO. However, the history of this firm started almost ten years earlier, when Steve Jobs asked IDEO to develop a new type of mouse for his new computer Lisa. IDEO developed a new mouse, still used today. The core value of the firm has always been

[29] Retrieved from: https://www.ideo.com/about

[30] Bill Moggridge (1943-2012) is a British designer and professor at Stanford University (1983-210). He is considered the first laptop inventor in the world. In her career, she has received many awards including Prince Philip Designers Prize.

[31] Mike Nuttall is a British designer and founder of Matrix Product Design in 1983.

to make all men understand their necessities and their latent needs. Indeed IDEO is defined as a pioneer of a human-centered Design; these are the words of the site of IDEO *"Even as our methods evolve in response to new, complex challenges, we're always designing solutions for people first. We're building to learn, and learning how we build, inspiration, ideation, and implementation"*. IDEO is composed by multidisciplinary teams (from anthropologists to food scientists to writers) so that they are always ready to face any kind of challenge.

Nowadays, IDEO counts more than 700 employees, based in nine countries and three different continents: North America, Europe and Asia; it is one of the largest companies in the world, respectable just as: Ford, Procter&Gamble Microsoft and so on.

In order to solve its challenges, IDEO undertakes a Design Thinking process profoundly focuses on a human-centered approach process. It harnesses the skills that everyone has but are neglected by the existence of more conventional problem-solving practices. It is based on the ability to be intuitive, to recognize patterns, to realize ideas that have an emotional and functional meaning and to express themselves through meanings beyond words and symbols.

It is evident that, few people want to lead a company solely based on feelings, intuition, and inspiration. However, it has been proved that also an extreme reliance on rational and analytical thinking could be a risk. In this regard, Design Thinking provides a third integrated approach called "3 I Model" developed by itself (as it has been explained in the previous paragraph). In order to achieve a new goal for every different challenge, IDEO always starts from the research, with the aim to acquire empathy and test intuitions; this research is hybrid because is both a qualitative research and a quantitative analysis. Then with the synthesizing of its research can spot themes and patterns as well as develop, analyze results or get to experimentation and rapid prototyping. The prototyping phase is particularly important because the designer thinker can get important feedback to carry out its prototype and transform this in a successful product. The implantation phase is when the product is almost finished and evolve our solutions to keep them relevant and sustainable.

In the paragraph below, it is possible to see some applications of the design thinking approach made by IDEO, to three different fields.

1.7.3.1 The field of wealth and wellness

In 2013, IDEO received a design challenge from UCSF (University of California, San Francisco) which recited *"Design key product and interaction features of a digital platform to identify and address the symptoms that profoundly affect the quality of life of young adults with schizophrenia[32]."* For this reason, IDEO built up a digital platform which motivated and engaged schizophrenia patients. More than thirty people in the world are suffering from schizophrenia and only the half of them receive psychiatric treatments with the use of medication for hallucinations and feelings of paranoia. However, schizophrenia provokes also other effects that medicines cannot do anything about such as memory deficits social anxiety lack of motivation and isolation. Many people associate this disease with a violent behavior the direct consequence is isolation. Moreover, for a schizophrenia sufferer it is also painful to do semicircular activities such as socialization. All this presupposes lead to a decrease in the quality of these subjects' lives with the consequence of the abandonment of both drugs and therapeutic sessions. San Francisco University researchers have sought IDEO's help with the goal of improving the quality of life of patients and, at the same time, stimulating their symptoms, through a digital platform. The result of this collaboration was Prime (Personalized Real-Time Intervention for Motivational Enhancer) is a mobile platform with two functions: on one hand it improves motivation and convolution, on the other hand it reinforces rewarding experiences. Prime appears as a simple application but it helps patients to remain concerned and motivated to certain behaviors that stimulate their health and social abilities and productivity. Prime also provides a motivational coaching service with professionals and, at the same time, the platform connects patients in order to make their level of socialization increasing.

32 Retrieved from: https://www.ideo.com/case-study/improving-quality-of-life-for-young-adults-with-schizophrenia

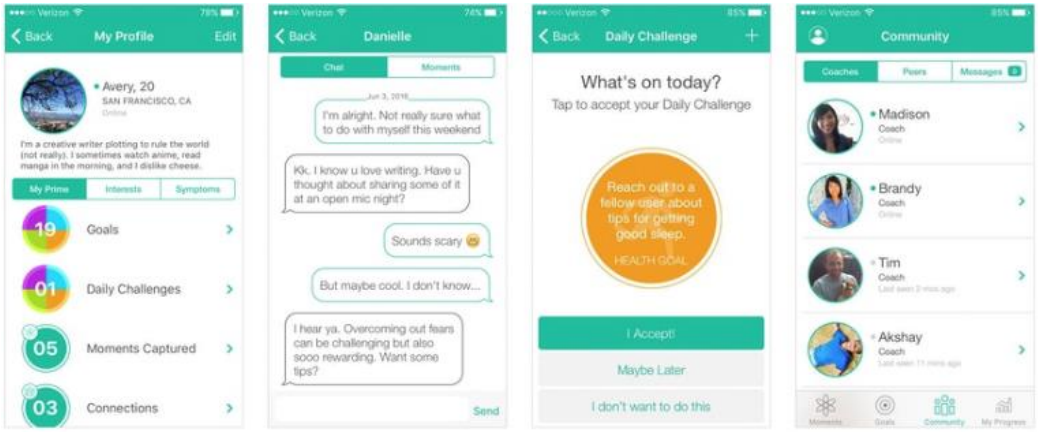

Figure 12 illustration of the Prime application. Retrieved from https://www.ideo.com/case-study/improving-quality-of-life-for-young-adults-with-schizophrenia

With the Primary application, schizophrenic patients can set up to five hundred mini daily challenges and subsequently show their progress. If users face problems during the day, they can ask to motivational coaches to be helped in achieving their goals. At the same time, Prime is a real social network that allows users to share pictures about important moments of their lives and goals. Prime's first tests have improved patients' quality of life, 80% of them have achieved their daily goals and the access rate within the platform is 4.5 times a week. Prime's positive impact on affected subjects has been proved also by patients' families: "*I wish you could have witnessed Anna's first response to seeing the faces and profiles on her phone" a mother said. "She looked at me, smiling, and said "Everyone looks normal. Everyone looks like people you see every day." It was like looking at a spectacle that reflected potential and hope."*

1.7.3.2 The field of government

In 2015 the Government of Los Angeles asked to IDEO to "*Revamp the entire voting system for America's largest jurisdiction*[33]" in other words design an intuitive ballot machine for every type of voter. In the Los Angeles government, voting systems that had not undergone variations from the 1960s so they needed to be reimbursed. For

[33] Retrieved from: https://www.ideo.com/case-study/a-new-way-to-vote-for-the-people-of-los-angeles

this reason, LA County decided to hire IDEO. Their ideal model was a modular system that matured over time. IDEO's goal was to create a voting device in which everyone felt comfortable, able to balance both emotional and functional needs. In order to face this challenge, IDEO decided to work with the Los Angeles contingent staff to deal with some of their difficulties, such as the vastness of the population and the numerous laws on the subject, to analyze them. The system IDEO had to design had to consider all kinds of voters, from the blind person to the one with motor disabilities or learning, but also to those who were unrelated to technology or English.

Figure 13 The voting machine in Los Angeles designed by IDEO. Retrieved from https://www.ideo.com/case-study/a-new-way-to-vote-for-the-people-of-los-angeles

The prototype shown above has been realized in collaboration with Digital Foundry and Cambridge Consultants, a system that is perfectly suited to all the needs of the voter and improves its experience. The user, through the use of the touchscreen, can display the list of candidates and vote misusers. For users with difficulty in reading, can use the audio experience with which they are guided in order to make their voting decision; it is also possible to select audio and display it in eleven different languages.

Dean Logan, Los Angeles County registrar recorder and County Clerk, said: "*We're not just redesigning equipment, we're redesigning an experience."* By 2020, Los Angeles County citizens should be exercising their right to vote with their future-forward system.

1.7.3.3 The field of consumer goods and services

In the month of January of 2015, Mattel, a worldwide company of toy manufacturing, hired IDEO for this challenge: "*Relaunch View-Master with a focus on a branded line of physical cases for an ecosystem of VR apps*[34]". View-Master is an iconic toy which dates back to 1939, stereoscopic toy has changed the world's vision from children who, through this toy, can contemplate much more beautiful landscapes.

IDEO and Mattel have redesigned this product, adapting it to the new needs of children and the digital world and thus have developed a new View-Master. This "new" product retains its predecessor's quaint features but at the same time creates a 360 degree virtual experience. The new View-Master is associated with a phone application that allows the user to visualize the desired landscape, from the dinosaur landscape or wildlife to the outer space through the camera of the phone. Inside the eyes a 3D effect is created, so the user moving his head can explore the different selected landscapes.

Figure 14 View-Master made by Mattel, designed by IDEO. Retrieved from https://www.ideo.com/case-study/modernizing-the-next-generation-view-master

Before the launch of the product, the company texts it with its target audience of children. This game can also be applied to different fields such as education or the

[34] Retrieved from: https://www.ideo.com/case-study/modernizing-the-next-generation-view-master

experience in a museum. Doug Wadleigh, executive Mattel, in an interview with CNET, said: "*Obviously, we're getting into this space pretty early. The goal is to create the View-Master brand for the next 75 years*."

1.8 The criticisms of Design Thinking

Not for everyone Design Thinking is a methodology that brings real competitive advantages; for a big quantity of people, it only consists in a trend which is destined to end. However, according to Bruce Nussbaum, creator of the Creative Intelligence text and professor at Pearson University, during the last 10 years, Design Thinking has had a significant impact both in the society and companies and has pushed the quest The latest in a creative approach they had never tested before. However, according to Nussbaum, the success rate of Design Thinking processes is very low.

Peter Merholz, a famous designer in San Francisco, criticizes Design Thinking affirming that a functional methodology in the field of Design could not be functional also in other areas. Furthermore, he also does not accept the dichotomy between Design Thinking and Business Thinking to compare a methodology applied by Adaptive Path founders. "*And much of our company's success has been in utilizing journalistic approaches to gathering information, winnowing it down, finding the core narrative, And telling it concisely*. So business can definitely benefit from such "journalism thinking." He continues: "But wait - there's more! We have librarians, historians and fine artists. All of these disciplinary backgrounds allow people to bring distinct perspectives to our work, allowing for insights that would not be achieved if we were all cut from the same cloth. Do we need to espouse "library thinking," "history thinking," and "arts thinking?" Should we look at Steve Jobs' background, and say what business needs is more "calligraphic thinking?"

Brian Ling also thinks that Design Thinking has died losing its meaning since it has been translated and immersed in completely different scenarios such as the corporate one. In fact, Same Ling compares Design Thinking to a Happy Meal that is a pre-packaged product for businesses. In addition, Ling criticizes in several ways the application of this methodology today. "*What makes it worst is when people from such design thinking think of integrated organizations are debating the right or wrong way in conducting Design Thinking. A right or wrong process but a right or wrong solution. "*

He continues saying that the Design Thinking award has to the creativity's death "Design is an iterative activity that only has broad guidelines but no fixed process. What's more important is that critical insights, sensitivity to consumer needs and beautiful solutions comes from the Creative chaos encouraged by an open design process. "*All of this got killed when the business mindset required design thinking to have structure, repeatability, and reliability*."

Despite the many criticisms that have emerged over the years, today little theories that go against this methodology are commonly widespread. The majority of the criticisms on Design Thinking consist in affirming that it is slowly losing its meaning because of the multitude of fields to which it is applied.

2. Design Thinking Education

The previous chapter, showed how design thinking can be applied to different fields, one of these is the education sector. "*Design Thinking is a transversal learning methodology which improves learning experiences and professional training*" indeed the most famous schools in the world have decided to adopt this approach.

The first part of this chapter focuses its attention on the schools which apply design thinking, one of the most important is Stanford University, successively the importance of design thinking in the field of education and the benchmarks adopted in order to assess a designer thinking. Then, a landscape of the education system has been provided with an emphasis on the benefits and skills in 21th Century, along with the phases of Design Thinking Education that are achieved. To give account to design thinking in the world of universities, it has been reported an interview of Martin Roger in which he declares why Business University has to address Design Thinking Education in order to give students the skills required by the work environment. Furthermore, this methodology can be very successful in K-12 education. In order to support this thesis, it has been reported a case study carried out by Carroll in which he explains three keys themes emerged in a class where a design thinking practice was implemented. The final part of this chapter has been focused on the point of view of many professors regarding Design Thinking.

2.1 The schools of Design Thinking

“Design Thinking is a transversal learning methodology which improves learning experiences and professional training”

This approach is not only used in the K12 range (it is a sum of primary and secondary education) within the education sector. In fact, many Design Thinking courses have been activated in the most important universities in Europe, Asia and North America. The School of Design Thinking in Postdam and Stanford University have been the first to teach by adopting Design Thinking within the Universities, for this reason they are two good examples of how design thinking has been successful in the field of education.

2.2 D.School of Potsdam and Stanford

"Hasso-Plattner Institute" in 2005 began teaching Design Thinking at Stanford University in California. The course was only addressed to engineering students in order to increase their ability to generate innovative ideas. Through the course, students learned how to create user-friendly solutions, it means: both economical and functional. In 2007, "Hasso-Plattner-Institute" built up his Design Thinking School, based in Potsdam, Germany. The course was addressed to students of engineering, more specifically for IT System students. Both cases became successful and attracted both new students and subjects coming from the industry world.

Today, in d.school classes, there are not only engineering students but different fields of study (engineering, economics, medicine, law, letters and sciences) with the goal of producing creative solutions to solve the most complex challenges, putting human values at the centre of their collaborative approach. In d.school, they believe that: *"We believe everyone has the capacity to be creative. In d.school is a place where people use design to develop their own creative potential*[35]". Within these schools, the "Hasso-Plattner Institute" in 2005 began teaching Design Thinking at Stanford

35 Retrieved from: https://dschool.stanford.edu

University in California. The course was only addressed to engineering students in order to increase their ability to generate innovative ideas. Through the course, students learned how to create user-friendly solutions, it means: both economical and functional. In 2007, "Hasso-Plattner-Institute" built up his Design Thinking School, based in Potsdam, Germany. The course was addressed to students of engineering, more specifically for IT System students. Both cases became successful and attracted both new students and subjects coming from the industry world.

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- **People**: there are multidisciplinary students, coming from different disciplines, perspectives and backgrounds, so that their ideas can go far beyond their limits All this entails not a way of “individualist” thinking but a mutual creation. In order to generate impressive results, one needs to assume a collective intelligence, whose result are extraordinary, able to generate a sustainable work process.
- **Place**: workplace must be free and flexible. Rooms have been adapted to all students’ in a way that they can feel comfortable to the point that they can optimize and interact with the available space. Furniture is customized in order to have a better fit with the space, thanks to the use of tables and partitions on rollers. Walls and surfaces are used to show ideas and results.

- **Process**: process requires a team always prepared to intervene in case of errors. Indeed in Postdam d.School thought that in Design Thinking we wish to think in the realm of the impossible. The user is totally placed in the heart of the empathic approach and its development. It activates the whole thought device of those involved - both the analytical and the creative-intuitive areas.

Figure 15 Process of Design Thinking in Hasso-Plattner-Institut. Retrieved from https://hpi.de/en/school-of-design-thinking/design-thinking/mindset.html

The challenges faced by d.school students do not come from written texts but they are real challenges, so that students can have a real impact on the world. Indeed, the d.school of Stanford directly collaborates with non-profit, corporate and government organizations with the aim to develop projects which can address real-world challenges. Very often, problems to which children are subjected to, are complex and ambiguous since there is no answer. Stanford d.school offers them the possibility to learn how to manage creative risks, by teaching them to accept failures and defeats.

An example of these challenges is the one launched to Stanford d.school. The design challenge consisted in "*The Embrace Warmer started as a class project at Stanford University when a group of graduate students were challenged to design an intervention: on for neonatal Hypothermia that cost less than 1% of the price of a state-*

of-the-art[36] ". Every year, 20 million prematurely and low-birth babies born in India. In developing countries, the mortality rate of these children is extremely high and at the same time incubators are rare and have a rare cost. This is the reason why students' objectives were to make an affordable incubator for developing countries. The group of students along with the Embrance's team (the commissioner of the design challenge) began analysing the new-born babies in the city of Kathmandu. Through this observation, they learned two important things: 1) the majority of premature babies came from rural areas; 2) many of them would have never survived in the hospital. For this reason, the incubator design had to be functional for rural environments and had to meet certain features, it had to be transportable, intuitive, sanitizable, culturally appropriate, and perhaps most importantly-inexpensive.

Figure 16 Embrance's team. Retrieved from http://extreme.stanford.edu/projects/embrace

The final product looked like a sleeping bag which could keep the baby's body right temperature for roughly four hours, thanks to the innovative wax incorporated in it. There was also the possibility to recharge it, only by submerging it in boiling water for a few minutes. The strength of Embrace incubator was that it was light and small, it did not weight too much, it was easy to transport and not expensive. Indeed, it costed only 25$ compared to 20.000$ of a common incubator. Since the first incubator was created, Embrace has pushed forward. They refined their business plan and their design, they seek funding, they have been interviewed by different media and it won

[36] Retrieved from: http://extreme.stanford.edu/projects/embrace

several awards. The first version of its product has been launched in India and the product now helps 200.000 babies across 20 countries.

2.3 The landscape of education system and the need of skills in the 21st century

"President Obama has also recognized the critical need to measure twenty-first century skills, calling on the nation's governors to: . . . develop standards and assessments that don't simply measure whether students can fill in a bubble on a test, but whether they possess 21st century skills like problem-solving and critical thinking and entrepreneurship and creativity (Obama 2009)."

Over time, students' profiles are changing more and more rapidly due to a change in the environment around them. We should not forget that today's students are part of the Web 2.0 generation. In this regard, Milton Chen, professor at Stanford University, says that the new generation of students will bring transformation into pockets at school, only through powerful handheld media devices. Through the new digital tools, the learning experience of students has completely changed; in fact, the teacher pedagogic paradigm has been overturned. However, today, there still is an ample debate about pedagogical approaches that may or may be suitable for this generation of students. The real problem is that, not always debates lead to a real change, in fact, in most of the institutions, "*Teacher's basic teaching approach that speaks to students as they sit passively in their homes*" remains like education strategy (Kelly Et al., 2008, pp. 12).

Even today, school curricula present a massive presence of theory-related subjects and the cultural and historical responsibilities of the institutions impose, not allowing time for students to focus on creativity, innovation, critical thinking and problem solving, activities defined as necessary for our future strength work. New generations have to possess such skills because future generations do not care about routine problems about new challenges with sophisticated technologies. All these factors are not always taken into consideration by today's teachers, whose pedagogy approach and curriculum are not adequate to feed the new generation of students, who represent our future, the only possibility to a real nation's development.

According to Pink (2005), Design Thinking will be characterized by a different way of doing it than to know where extreme right-brain capacities will be needed. For this reason, Heidi Hayes Jacobs, a world-renowned educator, proposes a new vision of a curriculum not only based on the necessary tools to develop specific expertise in different fields of study through a reasoned and logical construction; but fundamental expertise able to nourish and shrink students' creativity.

Hence, in order to meet the 21st century appeals, educators have to abandon the previous teaching methodologies and develop new ones in compliance with the today's demands, so that students will dedicate more time to the trial phase, experiencing a greater fatigue toward errors. This new type of learning suggested by Heidi Hayes Jacobs should involve children in a co-creation and problem-solving process at a collaborative level, so students are more likely to have features such as social sharing and engagement. Douglas B. Reeves[37] explains that educators must pay attention to their professional practice and their impact on students if they intend to transform educational responsibility from "*a destructive and unedifying force into a constructive and transformative force in education*."

In "Catching Up or Leading the Way: American Education in the Age of Globalization," Zhao (2009) underlines five hypotheses on which the school should teach:

- Skills and knowledge that can be useful even in the presence of machines.
- Creativity meant as a passion in doing new things.
- New skills and knowledge needed to live in the global world (foreign languages, multicultural literacy...) and virtual mode.
- High-level cognitive skills such as critical thinking and problem solving.
- Emotional intelligence is the ability to be empathetic so to be able to understand and communicate with others and the ability to manage and compose emotions.

Design Thinking is an approach based on the creative confidence of children through practical empowerment projects, promoting orientation towards action,

[37] Douglas B. Reeves is the founder of Creative Leadership Solutions. The author of more than 30 books and 80 articles on leadership and organizational effectiveness,

encouraging ideas and promoting active problem solutions - skills and competencies that line up with the five hypotheses Fundamentals Described by Zhao[38]. Through a curriculum which integrates Design Thinking, educators are able to allow students to develop of a set of skills and promote ideas that are generally not promoted in a traditional school institute. *"This process would contribute to different levels of creative thinking and creative mind-sets that can be achieved by design thinking education, culminating in a capacity that is called" creative confidence[39]"*. By applying designing techniques in the field of education, teachers leave the rigid patterns of traditional learning so that they can encourage students to undertake a creativity pathway, to look at issues from different points of view, and to develop their critical thinking that will be indispensable to solving any kind of problem.

In order to solve problems, design thinking utilizes interactive solutions and adding inventive imperatives that are highly consistent with the 21st century skill sets. Prototyping students, where objects are built and deconstructed, foster students' growth in exploration in order to generate better ideas.

Moreover, according to Wagner, a Harvard professor, there are "seven survival skills for careers, college, and citizenship" :

- Critical thinking and problem solving;
- Collaboration across networks and leading by influence;
- Agility and adaptability;
- Initiative and entrepreneurialism;
- Effective oral and written communication;
- Accessing and analysing information;
- Curiosity and imagination.

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[38] Yong Zhao is a Distinguished Professor in the School of Education at the University of Kansas. Nowadays is acknowledged as one of the most influential educational scholars, he has received many awards, the most important is the Early Career Award from the American Educational Research Association, Outstanding Public Educator from Horace Mann League of USA.

[39] Rauth, I. et al, 2010; Carroll et al, 2010

A concrete approach to improve/achieve these skills is Design Thinking.

Thinking like a designer involves different kinds of abilities and competences in different fields of knowledge: conceiving, planning and making products (Buchanan 1999).

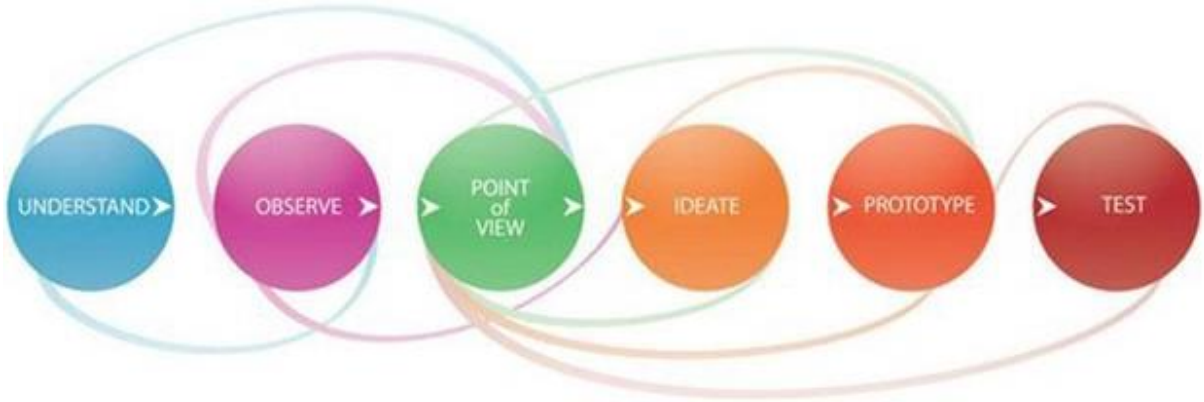

Figure 17 Design Thinking steps. Retrieved from https://dschool-old.stanford.edu/groups/k12/wiki/17cff/steps_in_a_design_thinking_process.html

Very often, Designers find themselves facing complex problems that they solve by providing high-level solutions through an evaluation and analysis process with the aim of constantly improving the end result (Dorst 2006). This is what students need to be enabled and what are the so-called key competences: addressing complex life-long problems by analysing and evaluating them to act in a responsible and responsible manner. Design Thinking satisfies both learning through experience and the complex problem solving among other things I am. Design Thinking can be applied at all age and curriculum levels, and it is also applied to K12 programs at Potsdam d.school in Germany. This approach can also be used in short and specialized courses, including only on subject matters, and in multidisciplinary classes with an extended course duration. Designing Thinking, we will see later, is able to satisfy most of the 21st century skills through its six-step approach.

The steps are as follows:

- **Understand and Observe**: The first step is to be empathetic in understanding people and situations where the problem is set. The goal is to understand the relationship between the problem and context in order to

define the latent need. When we talk about empathy is the ability to recognize the feelings, thoughts, intentions and characteristics of others.

- **Synthesis**: By defining both the problem and at the same time the context we can solve a problem through the generation of amazing ideas. All the information required in the previous step must be understood and filtered so as to generate applicable solutions.
- **Ideate**: It is the divergent phase of Design Thinking where ideas are generated by opening up the mind and being imaginative. All this goes through the team's brainstorming tool to generate, shape, and amplify ideas from the team. This is what pedagogy describes as the competence to apply knowledge.
- **Prototype**: It is one of the most important stages of the process, making the idea alive and tangible. The goal of this phase is to share ideas with others and make what initially seemed a vague idea in a viable and testable.
- **Test**: Tests realize the idea of the goddess and make it a sample of people. This phase is intended to receive feedback from people (experts, users, and all people involved with the process and with the problem). The next step is to pick up the answers to improve the idea; Design thinking having a human-cantered approach considers people's opinion to be fundamental.

The process is cyclical but dynamic at the same time indeed the team can return to the stage at any time so that the whole process can be repeated or just one step. The test phase already involves a smooth transition to the observation and understanding phase, as the context of the problem has changed with the idea.

2.4 Design Thinking applied in education settings

To apply Design thinking within a scholastic institution, you have to follow the Design process. In the previous paragraphs, it has been shown that there are several sectors which adopt design thinking process, but the three main sectors are: As we have seen in the previous pages there are several processes, but those that usually adopt to the educational sector are mainly three that are very similar to each other: the first one and the one described on the previous page. The second idea, created by IDEO, is made

up of five phases: **Discover**: Research Challenge and Inclusion of Design Challenge, **Interpretation**: Get information from the previous stage and arrange thoughts, **ideation**: Creating Creative Ideas without Limits, **Experimentation**: Phase Where ideas are transformed into prototypes and ideas are refined, **Evolution**: Thanks to the feedback received, the team completes the result and if the team has not reached the goal, it can restart the design process from the desired point.

Figure 18 The five phase of Design process. Retrieved from https://designthinkingforeducators.com/design-thinking/

The last model is that of Frog's Collective Action Toolkit, which is divided into six steps: 1) **Clarify goal**: The team must identify the problem and define the goals, the latter may vary according to the acquisition of knowledge at the design stage; 2) **Build**: This phase includes the constitution of the group to reach the specified problem; 3) **Seek**: It begins to decipher the problem to the root, interviewing person getting feedback from members and creating pattern quests; 4) **Imagine**: The group imagines new solutions and tries to turn them into actions. The tools to adopt in this stage are different from jam remix ideas; 5) **Make**: Because we do not know if an idea does not work until we do it, this phase focuses on building tests to understand problems we did not know before; 6) **Plan**: After gaining a vision to reach the goal, the team must realize a plan on how to achieve it.

Figure 19 Frog's Collective Action Toolkit. Retrieved from Frog's Collective Action Toolkit

The application of these processes and principles can be applied across different domains:

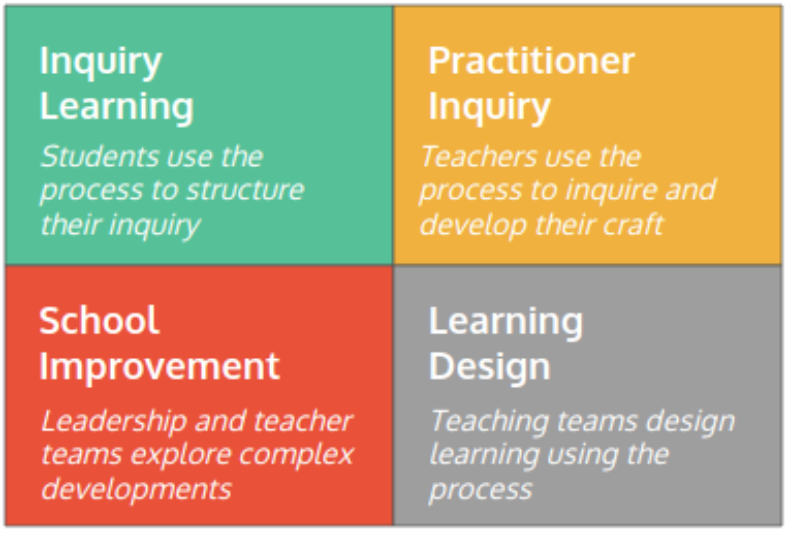

Figure 20 Applaying Design Thinking in Education. Retrieved from https://medium.com/@tombarrett/applying-design-thinking-in-4-different-ways-in-schools-9ab7c9dd6826

- Inquiry Learning Process (student): design thinking is a process to solve wicked or complex problems. Students engaged in Learning of Design Thinking develop empathy with people who are in the mood of a problem or argument. Empathy leads to a much more authentic level of connection with what is being explored. The testing

and prototyping phases are the interactive ones where students are being pushed to receive criticism and feedback

- **School Improvement (leadership / teacher):** Design Thinking offers solutions to improve the school system, it encourages students to face new and complex problems and it helps the members of a team to manage the inner organization of the group and recognizing school leaders. The team consists of school leadership. As this process leads the learner to the canter of everything, the more he/she is better compressed, the process is efficient so as to generate new ideas. The school team can develop interesting ideas on very complex issues and share it with customers even if the idea is still unclear.

- **Practitioner Inquiry (leadership / teacher):** It is about educators who are exploring practical problems and trying to deal with them and overcome them through Design Thinking. The site could include a wide range of topics ranging from the improper use of new technologies to agentic learning space. The first opening phase involves gathering information. For this phase, three types of elements need to be considered: Empathy: how can I better understand the perspective of those who have the problem, who are the stakeholders? Date: What data can I access and what can I generate? Observation: How can I look at the problem? What prospects? And how can I look at the problem without bias? Educators can do a good job if they are working on a similar project.

- **Learning Design (teacher):** The role of the teacher is being recast as a designer of learning. When we use Design Thinking, the focus is on the learner. At the time of designing the learning unit, Design Thinking is useful for planning our thinking and planning. Empathising: What do we learn about our students? How can we improve our curriculum? Which are the abilities we have and what do we need to achieve? Synthesising: Define the research questions to follow. Select and identify knockout resources. Generating and judging ideas: Concepts and concepts for lessons are explored, analysed and filtered. Prototyping: Prototypes are designed so that others can understand and offer feedback from students and colleagues. Implementing and Testing: New lesson sequences are implemented. Further reflections are required by reviewing observation and planning. Critical results are shared and traced back to the design process.

2.5 Why Design Thinking is important to education

Design Thinking is a method for investigating and defining wicked problems through a multidisciplinary approach, by following specific steps: gaining information, analysing knowledge, deepening empathy, experimenting new perspectives and ideas, visualizing and prototyping.

Design Thinking is essentially human-centered, multidisciplinary and collaborative, optimistic and experimental. For these reasons, it is suitable to be applied in education and training.

- **Human-centered:** The process begins with the understanding of the needs and motivations that he is human, students devote to empathy to rethink his educational system and learning methods. According to S.Goldman[40], "human-centered" is a fluid and dynamic process where students actively seek solutions to problems that meet the needs of others who may benefit from their innovation or design. Every commitment made by students makes them more human and helps them to see, to consider, to interact and to have empathy for others. This is the main feature that differentiates this approach from others.
- **Multidisciplinary and Collaborative:** they are characterizing elements to get an innovative and distinctive solution.
- **Optimistic**: Optimistic because it's believed that anyone, teachers and learners included, can create new solutions to solve a problem regardless of size, time and budget.
- **Experimental**: Design Thinking is based on the belief that mistakes make up an important element within the learning process. This is the reason why test errors are carried out in order to find the best solutions.

40 Stanford University School of Education - Professor (Teaching) of Education and, by courtesy, of Mechanical Engineering

According to Dunne and Martin, they highlight the benefits of Design Thinking Education: "*Under a design-thinking paradigm, students would be encouraged to think broadly about problems, develop a deep understanding of users, and recognize the value of the contributions of others*" (Dunne and Martin 2006, 512). So, we can deduce that through this process we can face any kind of challenge within the field of education such as improving curriculum, spaces, teaching and learning processes and tools as well as shaping educational systems. To transfer the Design Thinking methodologies in the field of education, it is important that the learners understand what the interests of students are outside of the school.

According to the study made by Lisa Phillips, an excellent student of design should be able to demonstrate that he/she is:

1) Comfortable taking chances and risks
2) Independent workers who are self-motivated
3) A refiner and self-editor
4) Passionate about everything they do
5) Curious
6) Capable of creating spaces that address human behaviours
7) Able to look at a problem in many different ways and ask “what if?”
8) Critical of their own work
9) Not afraid to let go of their first idea
10) Able to carry an idea through two dimensionally and three dimensionally

The design then develops the skills required in the 21st century.

2.6 Why University have to change through Design Thinking

Initially, the need to introduce the Design Thinking approach within the University arises from the fact that companies such as Procter and Gamble are introducing more and more Design techniques to solve business problems. As managers are increasingly interested in Design Thinking, it is important that students develop the

skills they require and that in turn universities adapt themselves through the formation of new courses.

Of course, the most criticized universities are those of Economics which are criticized for the values they give to students and at the same time to their teaching methods.

According to Roger Martin, dean of the Rotman School of Management University of Toronto, declared that "*Under a design-thinking paradigm, students would be encouraged to think broadly about problems, develop a deep understanding of users, and recognize the value in the contributions of others*." Roger Martin explore the extent to which design thinking can address the problems afflicting business schools. Roger Martin affirm that Business education has to be made more like design education. According to him the Management University have to address Design thinking for several different reasons:

- Business universities, such as Harvard Business School encourage students to present and analyse options based on deductive reasoning, that is, simply selecting what has a higher value through inductive logic, while designers use an abusive reasoning, namely, "What is something Completely new that would be nice if it existed but not right now? ". Universities should teach both ways to solve a problem. In fact, according to Martin, Design Thinking, includes inductive, deductive and abusive reasoning. In Aristotelian logic, inductive reasoning is given by certain situations, whereas the deductive one involves the logical relation between the elements.
- Second, they must teach **collaborative skills**, indeed students must be able to listen to and understand the process of thinking of other people in order to gain a different idea from the initial one. Instead, you are taught to build cases in your mind that are hermetic and completely logical, and anyone else thinks is the enemy you have to crush. Lastly, it is necessary to teach students to understand the user, whoever he/she is, and thus to gain **observation** and **inquiry skills**. Furthermore an important aspect of collaboration, however, is the idea of expanding perspectives by collaborating with individuals unlike oneself.
- Third, according to Cooperrider & Whitney also advocates improving the students' approach to the survey, that is, to **better understand what the**

other person thinks: "*If you tell me you think that the moon is made of green cheese, I want you to tell me more: Tell me what you observe, tell me what you see that makes you very confident that that's the case view.*" By understanding the other you can generate ideas out of the box because you can unite the idea that initially was just to the intellect of your mind, with a data or thought provided by another person. The understanding of the other is due to the degree of empathy of the designer who in fact feels essential to the innocence of the Design process. He distinguishes **empathy** on two levels: The first refers to understanding the users and their needs while the latter focuses on collaborating with their peers. In the first case, we must observe and reflect on the experience of users. While the latter develops mutual understanding of peers and rejects uncompromising advocacy.

- Fourth, with design thinking a student see constraints as an opportunity for invention that includes a questioning basic assumption and a resolve to improve the state of the world. Martin argues that constraints play a positive role in the design process as opposed to limiting. If something can't be done, it is only because the thinking around it hasn't yet been creative and inspired enough. Indeed, according to Buckminster Fuller: "*If something cannot be done, it is only because the thinking around it has not yet been creative and inspired enough*".

Martin in the article titled "*Design Thinking and How It Will Change Management Education: An Interview and Discussion*" elaborated with David Dunne, outlines three major issues in the current Management Universities:

1) **The "Values" critiques**, in the main Universities there is a lack of ethical values, in fact Ghoshal (2005) and Pfeffer and Fong (2004) explain to us that students are totally devoid of sense of moral responsibility.

2) **The "Relevance" critiques**, business schools produce little of both practical and management research. Bennis[41] and O'Toole[42] argue that: "*Some of the research produced by business schools is excellent, but because so little of it is grounded in actual business practices, the focus of graduate business education has become increasingly circumscribed and less and less relevant to practitioners.* [43]"
3) **The "Pedagogy" critique**, the didactics within the business universe is becoming more and more ineffective and the materials and methods are inadequate. In fact, Monaco tells us that that today MBA programs sound relevant to what the working model requires. He goes on to say that if the didactic programs do not change in the short term, managers will not have necessary skills and abilities indispensable to work.

According to Martin, Design Thinking will solve all three of the critical issues of the current Business Universities. As for Martin's first criticism, it is explicit that designers look at the interests of everyone, from stakeholders to society in general, so they do not care about the interests of a single subject. Thus, designers take the decisions as a whole so as to predict both impact and real consciences. The Design Thinking guides the designer to creative ideas so as not to yield to unpleasant compromises. Another designing value of design thinking is the absence of right or wrong, but rather how to think about the broader implications of their decisions.

The second and third criticisms are based, mainly, on research carried out by universities while the other is on the skills developed by students. As for the second criticism, Martin explicitly claims that there is a need for greater openness to abductive logic. Another step forward in business schools could be through the teaching of philosophy and history.

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[41] Warren Gamaliel Bennis (1925-2014) was an American scholar and is considered to be one of the pioneers of contemporary leadership study. Bennis was the founder of The Leadership Institute at the University of Southern California.

[42] James O'Toole is the Daniels Distinguished Professor of Business Ethics at the University of Denver's Daniels College of Business.

[43] How business schools lost their way, Warren Gamaliel Bennis and James O'Toole, Harvard Business Reviews

With regard to the skills developed by the students, according to Martin, students need to learn design skills as they need to develop their ability to adapt to increasingly less static and analytic problems that characterize the increasingly the business world. By introducing the Design Thinking all within these universities we could have both an up-to-date teaching experience and a future leadership class more prepared to solve the problems and needs of current and future generations.

2.7 A Case Study in K-12 Education

A middle school geographic class implemented a design thinking practice, this study is conducted by Carroll. From these studies emerged three key themes:
The first theme is design meant as exploring: students learned to explore different aspects of design problems prior to proposing design solutions. Design thinking was also found as a tool to foster metacognition skills of students. According to their explanation, metacognitive awareness means "*The ability to know where they are in the process and the goal they are moving towards" or "being mindful of the process*"[44].
The second theme, design as connecting, focused on the role of design thinking in developing students' creativity and confidence through active engagement, risk taking, and expressing ideas. Collaboration as a key component of design thinking helped them to solve their design problems together.
The third theme explained how to connect design thinking to an academic learning environment.

[44]Retrieved from: https://web.stanford.edu/group/redlab/cgi-bin/materials/Kwek-Innovation%20In%20The%20Classroom.pdf

2.8 The views of the professors regarding Design Thinking[45]

The case that I dare to question is that of the New Horizons Academy which is one of the few schools in Minnesota that uses Design Thinking as a method of learning to reach the academic goals of the students, in fact, has tightened a partnership with the d.school of Stanford. The New Horizon is defined as a place where students are "*Immersed in a technologically rich environment, seeing the world as a design challenge and with the eyes of a scientist, mathematician, engineer or technologist and graduate*" with fluency in STEM Science, Technology, Engineering and Mathematics and design thinking aptitude. The director of the New Horizons Academy is Dr. Alice who prefers innovative teaching methodologies, primarily Thinking, which he thinks should affect all aspects of the school and not just the curriculum and states that "*Design thinking puts them (the students) in an environment Where they are challenged to think differently it encourages natural curiosity and 'do not fear to fail*" The pioneering class of teaching application through Design Thinking all The interior of the school was selected directly by Dr. Alice in collaboration with selected professors who had passed several, namely: Miss Estella, a professor who had been practicing for more than twelve years, Miss Jacqueline, taught in GATE (Gifted and Talented Education program) And finally Mr. Lawrence, who taught the STEM-design class. The course mainly concerned four types of courses: mathematics, language arts, social studies and Design Thinking.

According to Dr. Alice, Design Thinking is the best way to motivate students both in learning and in being curious and in raising their knowledge. In this regard he states that: "For most of what we have done in education is 'Is it really okay to fail?' Does not design thinking do that? Whatever my users tell me, the technical part of design thinking makes the students more central and powerful and teaches students to prototype, test it and to examine the process. What is it building in the student's mind and psyche? A relational learning toolkit!". Below are the statements of the three professors regarding Design Thinking.

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[45] The entire paragraph is based on the research made by Kurokawa T. in the article called Design Thinking Education at Universities and Graduate Schools.

"Design thinking helps with motivation. It really does encourage them to realize that they can succeed, and if they can succeed then why not try. So design thinking is a way. And also by giving them projects that they are interested in as opposed to just throwing down a piece of paper and saying 'here's what we're going to do' - that helps.

(21 April 2011, Interview with Miss Jacqueline, Interview Transcript)

"Design thinking is definitely useful. Actually, the kids are so into it that they built things that are beyond my imagination. And they are so proud of their ideas. "

(22 April 2011, Interview with Miss Estella, Interview Transcript)

"Let them feel good. Let them feel accomplished. Get something done that they can have in front of them and say, 'I did this. I'm proud of this. I learned something from this. "

(20 April 2011, Interview with Mr. Lawrence, Interview Transcript).

From here we can deduce that students pursuing a Design Thinking course feel more confident about their work future and beyond.

Another feature of Design Thinking Education is the ability to move from theory to practice and then connect abstract concepts and by using creative strategies to develop creative ideas from passion and feelings.

With the Design Thinking application, they do not only improve student performance, as we have seen before, but also improves the institution in its complexity as there is greater collaboration and availability among teachers and at the same time represents an evolution in World of didactics.

3. The case of Active Learning Lab

This chapter deals with Active Learning Lab, an example of design thinking education carried out at Ca' Foscari University, established during the academic year 2016-2017. The following pages will introduce this workshop and outline its main objectives. Today, Active Learning Lab is one of the few examples of innovative education in Italy at university level, which brings students and firms together, in order to give participants the possibility to have a first contact with the world of work. Over the years, this important event has raised its attractiveness on the part of firms. This is the reason why today many global corporations are invited to launch innovative design challenges. Meanwhile, it has received many academic awards which have led Ca' Foscari University to open Active Learning Lab also to other Italian Universities.

3.1 Rules of Active Learning Lab

The Active Learning Lab is an innovative teaching lab of the Ca' Foscari University of Venice, designed by Professor Vladi Finotto in 2016.

This lab involves students and graduates from all Ca' Foscari master's degree courses, to which thirty-six places are assigned, as well as other students of Master's Degree courses from other Universities[46], to which sixteen seats are assigned, in this last case the participants must pay a sum of two hundred and fifty euros to be allocated to the Ca' Foscari University of Venice. Students with a foreign degree can also access. Up to fifty selected participants will be admitted to the lab[47], split into teams under the guidance of mentors, and lecturing guest speakers for a six-week period of time. One of the minimum requirements regarding the lab is that the participants must have a B1 level in both English and Italian.

The laboratory is the result of a collaboration among several companies and organizations: Ca' Foscari University Foundation, Ca' Foscari's Placement Industry, Venice Chamber of Commerce and Rovigo Delta Lagunare, companies that collaborate in each edition and AzurroDigitale, a Start Up from Padua. This one drives companies towards a digital maturity model, by following the guidelines of Design Thinking and Open Innovation, providing tutoring to students and teaching lessons during the lab. The applying companies / organizations can come from any sector and any revenue as long as they do not miss an innovative vision, so to present both current and future challenges. Businesses need to get closer to students, by helping them to understand the business world and, at the same time, be not afraid of change.

Students are selected by the Ca' Foscari Scientific Committee aiming at ensuring multidisciplinary participants and heterogeneity of knowledge as well as a development perspective of innovative ideas; as a matter of fact, young people with different backgrounds are selected: technical, scientific, humanistic, economic and linguistic.

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[46] The opportunity for other Universities, which are not included in cafoscarino, to enter the Active Learning Lab was introduced in the last ALL (Active Learning Lab), whereas in the previous ones only graduate students or graduates from the university of Ca' Foscari could enter.

[47] Lab training consists of fifty participants, but this was only applied in the last Active Learning Lab, since for the three previous ones carried out in the academic year 2016/2017 the maximum number of participants were forty.

This helps to create the preconditions for the success of group projects. Students have access to a lab that is based on three parameters: the first step in the selection process is based on the curriculum vitae, secondly also the online form is taken into account: an introduction video length to be maximum one minute has to be uploaded on Youtube. If these two parameters are considered valid, the potential participant will attend job interviews held by a select committee. During the interview, the following skills will be assessed: participation in innovative teaching initiatives, experiences of entrepreneurship in Italy or abroad, soft skills, motivation, personality and attitudes will be evaluated. According to the sum of the scores given from the first two steps (curriculum vitae and online form), the list of competitors suitable for the lab shall be published through the last step (interview).

The attainment of at least eighty percent of the lessons, a successful completion of the final exam and the assignment on time of scheduled tasks, will allow the participants to build up six training credits, recognized during the student's path, such as: replacement of internship activity, free-choice examination or surplus in number (as approved by the Reference Educational Colleges and the final certificate). The participant is therefore allowed to a maximum of twenty per cent of justified absences as long as they are not made during the first week of the course.

The goal of the lab is to make the participant understand today's world of work, to know how to approach to the client, to teach students how to face real challenges offered by collaborating companies and to provide them a methodology in order to find effective and innovative solutions. The methodologies used are three Design Thinking, Lean Start Up Business[48] and Model Canvas[49], useful for young people to enter the

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[48] Lean Start Up Business is a methodology created to build innovative ideas and activities. This approach can be used both by new businesses or projects, as well as consolidated businesses, and leads to a sustainable business based on saving costs and time, thus decreasing the risk of bankruptcy. This methodology was developed by Eric Ries in 2008, initially widespread mainly in Silicon Valley while still in the world today. The methodology consists of three phases: design, ongoing testing and modification, so to keep up with the result following a step by step process and by using massive technology, according to the customers' needs. These factors shall apply keeping costs down.

[49] Business model Canvas is an innovation of model canvas with a least one of the nine blocks (key partner, key Activities, key resources, Value preposition, Consumer relationship, Channels, Customer segments). It is an innovation that concerns the overall organization behind the offer itself. Business model canvas is relevant for business competitiveness because every firm can be strongly competitive,

workplace. The last goal of the laboratory is to strengthen the local ecosystem for innovation by setting networks among universities, institutions, businesses and associations of the territory.

Active Learning Lab takes place at Ca' Foscari University of Venice ("Ca' Foscari Zattere", Palazzo Moro and San Giobbe[50]). The first edition of ALL started in September 2016. Since that moment, every year three editions are commonly held in Venice and a special one in the city of Treviso. Every ALL is about a specific theme which addresses the design challenges issued by the firm.

3.2 How Active Learning Lab is structured

Active Learning Lab is an innovative educational workshop of six weeks with the aim to develop products and services designed to innovate the business approach to the related market. It is organized as follows: five meetings during the first week and two meetings over the last five weeks. After the first week of transmission of methodologies and development of ideas, the commitment requested for the rest of the workshop is about two mornings in class following the lesson autonomously and another one always in class, within a group of work. Let's now go more deeply into the organization of Active Learning Lab through the week and how and what are the main personal and collective expertise one learns during the workshop. Every week, a professional from different fields is invited to give a lesson about the topic addressed by ALL, an extremely important and inspiring moment for the students who call this session "pillola con l'esperto" in Italian, which means "precious teachings with the expert". This is how the workshop is scheduled week by week:

by innovating just one of the nine blocks of business model Canvas. The unique value proposition is what often makes the difference in the adoption process.

[50] It consists in a library, which provides spaces dedicated to individual and collective groups of study as well as rooms designed for seminars, rest areas for study breaks and WI-FI.

- **Week 1 – full immersion on methodologies:**

  Lessons are given by the concerting firm "AzzuroDigitale", represented by Davide Boschiggia[51] who makes his expertise and experience in the field of design thinking, lean start-up and business model canvas available to participants of Active Learning Lab. Meanwhile, he is a tutor in the class collaborating with many facilitators in order to help students to face and solve the challenge. At the very beginning of the workshop, Davide Boschiggia, in order to foster people getting to know each other and to introduce design thinking approach, proposes a game. It consists in working in groups of two people made up of an interviewer and an interviewed who has to answer to many questions about his life and his personality. Before starting to answer, both these two people have to sketch their ideal wallet without showing it to the other. Through these questions the interviewer collects all the necessary data to understand which kind of ideal wallet belongs to the interviewed and after the answers of the latter, he tries to draw his ideal wallet. At the end of this activity, it has to be shown if the two drawings correspond one to each other. During the first two meetings, students learn design thinking approach, starting from the definition of design, its essence and its implementation in everyday life. Furthermore, it is explicated how it is possible to become a good designer by watching videos of famous speeches such as the one of Tim Brown during TED talks, in which he urged designers to think big, improve their creativity and develop innovative ideas. After this moment, design thinking process and its application are explicated in order to solve a design challenge. Another concept the workshop deals with during the first two lessons is the human-cantered approach and the importance of observing. To this regard, products, spaces and services realized by IDEO are taken into consideration as good examples of how, thanks to observation

[51] Davide Boschiggia is a product design and a designer thinker specialized in the teaching of three different methodologies: design thinking, lean start-up and business model canvas. He also is the organizer of TEDx Padova since January 2015.

and the human-cantered approach, it is possible to achieve big goals. Moreover, the different steps of design thinking are described in details.

The first one is **discovering**, in which it is taught to students how to undertake a pathway to research, how to concentrate on the concept of *challenge,* how to set up a summary to detect human needs, how to look for inspiration in similar contexts and, in the end, focusing on the importance of building up a network to keep contacts with users and experts.

The second stage is **interpretation**, during which students learn how to interpret the data gathered before, through the cataloguing of the material collected. At this point, it is taught to students how to realize a *personas*[52].

The third phase is **ideation,** when it has given space to the explanation of

Figure 21 Different examples of personas. Retrieved from: www.clearvoice.com/creating-creative-personas

[37] *Personas* are fictitious people created to represent a specific target of behaviors and needs of real human users. They are outlined on the basis of information collected through activities of research both quantitative and qualitative. Retrieved from: personal source

brainstorming since the moment of its preparation to the selection of the most promising ideas, with the realization of drawings. In order to create a comfortable *brainstorming* environment, the members must assume a moderate behavior and involve external participants to join the group, so that they can give their precious contribute crucial to achieve concrete results. During the explanation of brainstorming, Davide Boschiggia proposes a game which consists in listing all the possible use of a clip in two minutes of time.

The fourth step is the **implementation of a prototype**, which consists in the result of the best idea obtained during the brainstorming exercise. At this stage, it is underlined the importance of feedbacks coming from the sample for the test.

Finally, the last stage is **evolution,** in which it is explicated how to prepare the material necessary to represent the creative pathway produced by the prototype. Thereafter, students are expected to learn the feedback coming from the commissioner and to think how to concretely realize a project.

In the last meeting of the week, Jacopo Pertile [53], one of the members of "AzzurroDigitale", introduced his lesson defining the word *innovation* and its importance in our present-future. He also explained to students the methodology of business model canvas by bringing concrete examples of firms which adopted this approach, so that they could have a clear vision of the nine blocks of the model. After this crucial introduction, he divided students in groups randomly, assigning to each group the task to build the business model canvas of a specific firm in order to make them understand how to apply this model in a concrete way. During the following hours, Jacopo Pertile explained the lean start-up approach starting from the historical concept of *"lean manufacturing system"* up to the ideation of the lean start-up approach

[38] Jacopo Pertile is the co-founder of the firm "AzzurroDigitale" and one of the organizers of TEDx Padova.

given by Erik Ries in 2008.[54] In the afternoon, one or more experts are invited to talk about issues related to the main theme of ALL and, at the end of the day, a part is dedicated to the so-called “pillola con l’esperto”.

- **Blue Wave: twenty-four seven NO-STOP**

  The days of Saturday and Sunday are entirely dedicated to Blue Wave, an event organized by “AzzurroDigitale”. It starts in the morning of Saturday at 10.00 a.m., and finishes at 1.00 p.m. on Sunday. In the first part of the day, the firms (which will launch the challenge) are presented to students; thereafter all the participants are divided into groups of 5 or 6 people, in line with the criteria above-mentioned (such as the factor of multidisciplinary). Every group works on a specific design challenge to solve it, with the help of a facilitator who will be present for all the period of the Active Learning Lab, in order to guarantee to all the groups involved in this activity, the success of the final products.

  Students starts to work on the project in the early afternoon. During the night they enact all the phases of design thinking process, learned over the week, and they are called to solve game-challenges, a sort of mini workshops, such as: robot raise, consisting in the programming of robots, and quiz challenges. After a night of planning, In the morning of Sunday, every group presents their innovative idea to solve the challenge assigned by the firm which hears carefully the explanation of their projects, gives them positive or negative feedbacks and suggestions to improve or modify them. A fundamental aspect which has to be pointed out, is that the aim of *Blue Wave* is not only to make students apply the design thinking process but to make them build a comfortable environment. This will help to encourage the team-building, where they can get to know each other and to explore their different backgrounds, their strengths and weaknesses.

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[39] “Erik Ries in an American entrepreneur, blogger and author of The Lean Startup, a book on the lean startup movement.” Retrieved from: Wikipedia.org

- **Week 2-3 – Exploring and Definition:**

  After the first week of Active Learning Lab, students are urged to work to the second phase of the workshop. At this stage, every group, previously involved in the resolution of a specific challenge assigned by a firm, is asked to be committed to solving the challenge a firm had given to another group. They now have to find an innovative solution to the challenge, following every week a determined phase of the five design thinking phases: exploring, interpretation, ideation, experimentation and evolution. Therefore, these phases are explained more in detail, hence students learn how to focus on the goals to achieve in order to solve the design challenge, they learn to plan the interviews they will carry out during the weeks, always by referring to the stakeholders directly involved in the world concerning the design challenge. After that, *personas* are created with the aim to give a human face to a series of data and information which otherwise would end up to remain abstract and imaginary. This encourages the participants to use a human-centered approach and to increase their level of empathy. At the end of these two activities (interviews and the creation of personas), students have to show their work to Davide Boschiggia who gives them his feedback and opinions.

- **Week 4 – Ideation:**

  During the fourth week, students examine the concept of **ideation** in depth, one of their favorites, since the watchword is having fun. At this point, they have to implement four tasks: the first is *brainstorming*, when they learn how to undertake a successful brainstorming exercise which help them to look for new solutions to achieve the design challenge, through the use of post-it, pencils, markers and placeholders. Students are reminded that, as this concerns the divergent phase of design thinking, every idea could be a good and innovative idea, what is important is that, at the end of this process, ideas are clustered and assessed by students. The second is **conceptual map** through which ideas and concepts are represented

in order to give them a solid structure, necessary to analyze, to synthetize, to remember and to dry them.

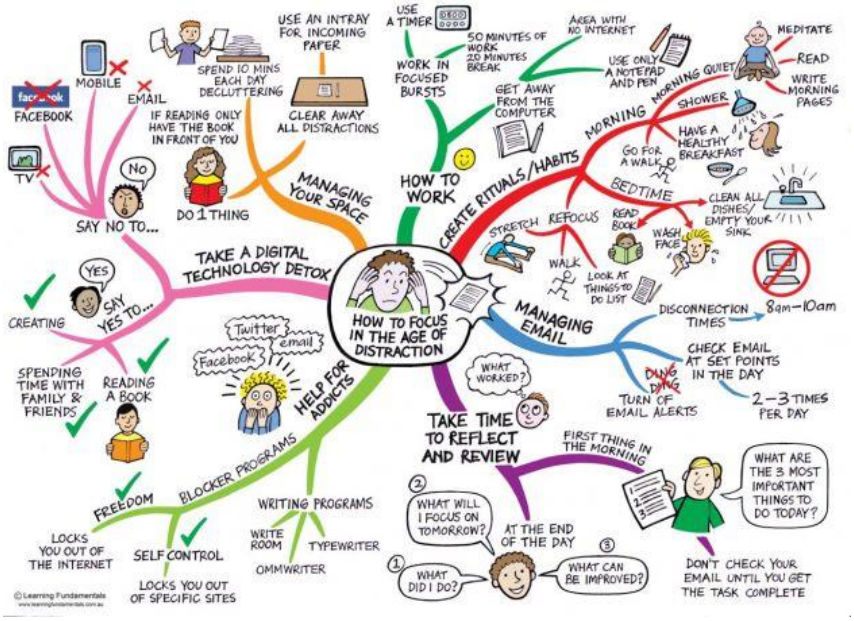

Figure 22 An example of conceptual map. Retrieved from: https://www.pinterest.com/pin/36451078204422650/

The third task is the **mood-board.** It consists in a board made up of a series of pictures combined as in a collage, with the aim to present to the commissioner of the design challenge, data and the specific mood with which it is intended to develop the project. The last one is a **semiotic framework** which helps participants to manage the *personas* involved in the design challenge, to place the ideas coming from the brainstorming activity in a way that it is possible to assess their feasibility.

All these tasks carried out by the students, with the help of facilitators and the supervision of the commissioner of a specific firm, are shown to Davide Boschiggia. This latter will assist them to select ideas coming from brainstorming which can directly pass to the following and last phase of design thinking. As every Friday, students close their week with the so-called “pillola con l’esperto”.

- **Week 5 – solution:**

  After four weeks of activities, students approach to the last phase of the workshop. At this point, they arrive to the part of selection of the best idea elaborated over the last weeks to solve the design challenge. Hence, they get close to the penultimate stage of design thinking process: prototyping and simulation. Davide Boschiggia teaches to his students that a prototype is a product on which it is possible to do tests and receive visual as well as functional feedbacks. Meanwhile, a prototype in the world of product design, is the main tool to make a two-dimensional concept becoming three-dimensional. Furthermore, students are taught how to implement a rapid prototyping[55] through the use of means easily available and cheap, such as: paper, card stock, glue and scissors.

Figure 23 Three examples of the result of a Rapid Prototyping carried out during the Active Learning Lab. Retrieved from: private source

[55] Rapid prototyping is a set of industrial techniques used to create a single piece of small series, the so-called prototype. This definition makes clear the strength of this technique: possibility to implement a prototype in very short time, no matter its shape and its geometric complexity. The most commonly used technologies are ARDUINO and 3D-prints. In 1998 Neil Gershenfeld, professor at MIT, opens his course: “How to make (almost) everything”. This signed the birth of the “Makers” movement and the first Fablab. Retrieved from: AzzurroDigitale

This proves that even with these simple and affordable materials, one can achieve good results in the world of prototyping; so a low investment can be considered a way to show the products functioning and receive as many feedbacks as possible. Moreover, thanks to a rapid prototyping, students have the possibility to create applications and web sites, always by using poor materials, easily assessable whereby giving feedbacks necessary to improve the initial idea. It should be considered that, this method is also useful to prototype ideas linked to services which require a higher level of complexity. In this case, simulation involves men and women to interpret a specific part as in a piece of theatre. Finally, students learn that an indispensable tool for the rapid prototyping is Lego[56] through which it is possible to build spaces and make the archetypes of people interact with spaces.

The lesson on rapid prototype is given by Andrea Vial, IoT specialist at AzzurroDigitale. He explains students what are the steps they should undertake in order to carry out a rapid prototyping: wire frame, mockup and prototype. The first one is outlining (schematizzare-delineare). More in detail, if we take a web site into consideration, where **wire fire** represents the layout and contents are specified along with the composition of the interface and the navigation system. The second one, **mockup**, is a model in scale or at dimension (modello in scala o a dimensione) of the product. It is widely used to assess design, represent the various contents in details and to show the basic functionalities in a static way. In order to implement mockup many specific websites are suggested, like: Canva or Google Drawings. Finally, **prototype** is a mockup allowing the simulation of at least one functionality of the project; in other words, it leads a person to experience and test its usability. However, it does not consist in the final product but it is only a simulation of the experience. Also in this

[56] Lego is a Danish firm producing toys, founded in 1916 by Ole Kirk Kristiansen. It is famous over the world for its interlocking plastic bricks. Retrieved from: Wikipedia.org

case, applications and websites are suggested in order to develop 3D images and very easy web sites such as: App Inventor.

During this fifth and last week, students have learnt how to transform an idea into a concrete project. As it is usual at the end of every week, they have to show their works to Davide Boschiggia without passing through the feedback given by the firm due to the fact that they will show them at the end of the following week.

- **Week 6: delivery/demo day**

  The sixth week is the last of the workshop and it is almost entirely dedicated to the delivery of the final product. Indeed, students learn how to perform an efficient presentation of the project. Hence, they must understand how to communicate the proposal they have elaborated over the past weeks to solve the design challenge assigned by the firms and implement their prototypes taking account of the suggestions proposed by tutors and facilitators. This last week counts few hours of direct teaching due to the fact that students are invited to spend a big quantity of time working in groups.

  The last day of Active Learning Lab is the moment when all the participants present their ideas in front of firms and the other members of the workshop. Therefore, the latter provide them their feedbacks about what has come up during the presentation of the respective project implemented by each group This will be followed by many questions posed by the firms, in order to deepen certain aspects, by involving where possible also other spectators who desires to give voice to curiosities. In this phase, it has also left space to stakeholders, who are present at the workshop, to come up with suggestions and comments. At the end of the day, every participant receives his/her certificate of participation to the Active Learning Lab, whether the regulation above-mentioned has been properly seen. What is extremely important to underline is the fact that, in this final stage of the workshop, all the students learn to interface themselves directly with the firms and to communicate in front of an audience, in order to present their projects, in an efficient way.

3.3 Active Learning Lab editions

Every edition of Active Learning Lab has specific theme directly related to proposals of firms and organizations involved. The themes proposed consist in problems or challenges they wish to solve and to develop by applying innovative methodologies, with the involvement of a wide audience composed by: students, mentors and experts in certain fields. The first edition of ALL was focused on sustainability, the second was about agro-food, the third concerned the themes of design excellence and made in Italy while the last one, held in the city of Treviso, has had its theme: Urban Innovation. Finally, in the month of September 2017, when the last edition of Active Learning Lab has been hosted, the core of the workshop was focused on marketing innovation. Let's now analyse every edition in details.

The first edition, concerning the theme of sustainability, started the 19th September 2016 and ended the 28th October 2016. The firms involved included the names of: *Favini*[57], *Gruppo Argenta*[58] and *Stevanato Group*[59].

- The challenge of Favini concerned finding a way to make stakeholders perceive the know-how of the firm about research and development in order to create new productive opportunities, starting from the use of

[57] Favini is active since 1736. "It is worldwide leader in the design and production of textures and finishing solutions for eco-leather for fashion, luxury, design, IT and technical sportswear sectors. Favini is also a leading global producer of graphics specialties, natural fibres-based (cellulose, algae, fruits, nuts, etc.), for the packaging of luxury and fashion industries. It also operates in the converting products industry sector that includes activities related to the creation and production of stationery for school, leisure and office, for high-end market". Retrieved from: http://www.favini.com/en/about-us/company/

[58] Gruppo Argenta has worked in Italy for over 40 years as a distributor of food vending machines. Retrieved from a private source.

[59] Stevanato Group founded in 1949. "It is the world's largest, privately owned designer and producer of glass parenteral packaging for the pharmaceutical industry. From the outset, Stevanato has been self-sufficient in developing the necessary technology and machinery required to ensure the highest standards of quality and innovation throughout the production process".

Retrieved from: http://www.stevanatogroup.com/en/identity/profile/

by-products of food processing. Furthermore, they wanted to find new fields of application for the *silver skin of coffee*.[60]

- The challenge of Gruppo Argenta concerned finding a solution to improve the relation between user and distributor with a completely sustainable approach and using the most innovative technologies. In this way, distributor would have become a useful object with a positive social impact.
- In the end, Stevanato Group asked Active Learning Lab to design an innovative way to publicise a modern teaching space, characterized by a high technology value, where teachers could experiment new educational methodologies, by involving the territory with the aim to have a positive social impact on local communities.

The second edition of Active Learning Lab, about the theme of agro-food, started the 9th November 2016 and ended the 16th December 2016. Participants had to face the challenges assigned by three main firms: Donatella-Forno d'Asolo[61], Coldiretti Venice[62] and Agricola Lusia[63].

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[60] The silver skin is a biomass deriving from coffee used for the production of energy by combustion. Retrieved from a private source.

[61] Donatella Forno d'Asolo "was established in 1946 thanks to the experience of its founder, Giuseppe Marconato, who set up an artisan pastry shop. At the beginning of the 60s, as a result of Giuseppe's business skills and determination, the shop gained a foothold in the market of Northeast Italy, in particular along the Venetian coastal area. Today, the company continues to grow and, along with the production of fresh pastries for the local market, is now producing high quality frozen bakery products". Retrieved from: http://www.ladonatella.eu/en/company

[62] Coldiretti Venice, with its half million members, is the main organization of agricultural entrepreneurs at National and European level. Since the Italian territory is characterized by a wide range of products, its mission is to re-think about a place entirely dedicated and structured on the basis of the quality of every production which could change a sale's moment into a sensorial experience.

[63] Agricola Lusia is a young and dynamic firm based in Veneto, specialized in import of overseas citrus fruits throughout the world. Over the years, it has become one of the leaders in the import of fruit. Indeed, it counts a wide range of certifications attesting its quality.

- The latter has decided to launch three different challenges, the first one was about how to convince Italians to drink orange juices also in the month of August. To this regard, **Agricola Lusia** showed that the peak of sales of orange juices is mainly concentrated during the Winter season. Thereafter, it launched the second challenge, concerning their wish to approach consumers to buy oranges, under the brand "Gioia[64]", during Summertime. All this, had to be done by communicating the seasonality of their product by referring to its production area, with an emphasis on the safety of the imported product directly granted by Agricola Lusia through its supply chain. Moreover, they intended to convince the buyers of a large-scale organised distribution to support this consumption. The third and last challenge of this firm concerned how to make the brand "Gioia" attractive for users by linking it to the concepts of healthy food and lifestyle.
- **Coldiretti Venice** assigned two different design challenges. The previous was about how to project a new purchase experience through an innovative retail, valorising the seasonality of products and zero kilometres ones, emphasising the passion of producers, in a citizen context with the aim to requalify urban areas. The latter consisted in making food a universal language and an attractive project also for agricultural producers from different cultures who cultivate their typical products in their country of provenance, by undertaking a process of social integration.
- **La Donatella Forno d'Asolo** launched its first design challenge with the aim to understand what the pastry of the future could be in terms of shape, packaging, communication and consumption pattern. Therefore, it launched other two design challenges. The previous was about to foresee the future consumers' lifestyle and finding a way to innovate the frozen bakery products' communication, in order to enhance their freshness and genuineness, by preserving the excellence of made in Italy. The latter concerned creating new needs and innovating the market segment, in which the firm operates, by taking particular account of the French and American markets.

[64] Gioia is a brand of the firm Agricola Lusia created in 2016 after the selection of products coming from all around the world, with the aim to improve the lifestyle of consumers and spreading their positive values.

The third edition of Active Learning Lab was focused on the theme of design excellence and made in Italy. It started the 6th February 2017 and ended the 17th March 2017. The firms involved in this workshop were: Moroso[65], Kalisté[66], Unifarco[67] and Vista Eyewear[68].

- **Moroso** invited students to find a way to communicate, as best as possible, the precious relationship between craftsman-designer and entrepreneur always by having vision and being creative, all prerogatives at the basis of the excellence of a brand.
- **Unifarco** with its challenge wanted to push its consumers to test products under the brand Dolomia and attract its loyal clients through new and technological strategies of communication.
- **Kallisté** wished to outline new methods of interaction with its products and establish an innovative relation with its brand, which can be considered a starting point to ideate alternative channels to sell and get in touch with future clients.
- **Vista Eyewear** exhorted participants of Active Learning Lab to ideate a new approach to sell its products, within the Italian market, by telling to its

[65] "Moroso has been working in close collaboration with some of the world's most talented designers to produce luxury sofas and seating since 1952." Retrieved from: http://moroso.it/azienda/?lang=en

[66] "KALLISTE' is a company and a brand owned by Italian Holding Moda, a company established by Cleto Sagripanti an entrepreneur from Le Marche region who wanted to enhance the fashion brands having the highest growth potential." Retrieved from: http://www.kalliste.it/en/about-us-2/

[67] "Unifarco is based in Santa Giustina (BL), Italy. It promotes a culture wellbeing, it creates products which help people feel better and provides pharmacist with tools and services so they can advise their customers on their health while maintaining their independency. It is composed by three brands: Research Pharmacists, Unifarco Biomedical and Dolomia." Retrieved from: http://www.unifarco.com

[68] "Vista Eyewear is an Italian company ready to face every challenge in the fields of research, design, construction and distribution of frames for eyeglasses and sunglasses. In Northeastern Italy, in the heart of the eyeglass district, we use the master craftsmanship developed in the area and local resources to guarantee authentic Italian artisanal quality for our partners."

Retrieved from: http://www.madinitaly.com/en/about-us-contacts

consumers the values of the firm, both from a technological and aesthetic point of view, in order to convince opticians to sell its glasses.

The fourth Active Learning Lab, held in the city of Treviso, started the 19th of June 2017 and ended on 28th of July 2017. Its theme was about Urban Innovation. It has to be underlined that, contrary to the other editions, firms/organizations involved were 4 instead of 3 and were the following: Fuori Programma di Cooperativa Solidarietà, Progetto per l'età evolutiva di Gruppo Terrario e Centro della Famiglia, Social Lighting di Arianna Led[69] and Urban Center del Comune di Treviso e Treviso Smart Community.

- **Fuori Programma di Cooperativa Solidarietà:** Launched its challenge to promote social inclusion for people with disabilities or living in conditions of social marginalization.
- **Progetto per l'Età Evolutiva di Gruppo Terraglio e Centro della Famiglia:** asked participants to carry out a sanitary-sportive-social project for children and young people affected by specific learning difficulties.
- **Social Lighting di Arianna Led:** its challenge consisted in a project based on the interaction with citizenship through public lighting in order to develop the sense of community and wellbeing.
- **Urban Center del Comune di Treviso e Treviso Smart Community:** during Active Learning Lab students were asked to ideate a urban space to promote the participation of citizenship with the aim to make significant changes to the territory.

3.4 Guests at Active Learning Lab

During the first edition of Active Learning Lab the experts who participated in the workshop were: Marco Fasan, Alfonso D'Ambrosio, Giovanni Cons, Laura Cortellazzo,

[69] "Arianna – specializing in the design and manufacture of LED lighting systems – was established in 2009 by Alberto Giovanni Gerli. Arianna has grown since 2009 and is now majority owned by Carel spa, an Italian multinational company specializing in electronics for air conditioning and refrigeration systems, that brings the assurance of solidity and reliability. Our fittings illuminate roads, roundabouts, cycle paths, parks and tunnels and bring light into manufacturing facilities, supermarkets, car parks, warehouses, large shopping areas and sports fields". Retrieved from: http://www.ariannaled.com/en/

Paolo Ganis, Manuela Marangoni and Andrea Maragno. Marco Fasan is assistant professor in accounting department of management at Ca' Foscari University and currently holding courses in management accounting both bachelor and master degree level at Ca' Foscari University. Alfonso D'Ambrosio professor at IIS Cattaneo Mattei of Monselice, defined as the best innovative professor in Italy. He taught to the students of ALL what are the necessary tools and elements which can make the educational sector innovative and captivating. Giovanni Cons founder of Uniwhere and project manager at Toshiba Europe GmbH offered to the participants of ALL knowledges about Scrum[70]. Laura Cortellazzo, researcher at Ca' Foscari Competency Center, gave a lesson about transversal abilities. Paolo Ganis taught how to build up a start-up and use the platform of Kickstarter, he is the founder of the firm Clairy. Thereafter, Manuela Marangoni is senior trainer at Talent Partners Srl and gave a lesson about public speaking and presentation, by illustrating to students which are the techniques to enact in order to speak in front of an audience. Andrea Maragno, partner and co-founder of JoeVelluto explained participants how to manage the phase of ideation within design thinking process.

After having enlisted the names of the experts who took part to the first edition of Active Learning Lab, let's now go on and deepen the guests involved in the second one: Giorgio Soffiato, founder of the firm Marketing Arena a digital marketing agency; Alessandro Rossi, founder of People Rise, a developer and facilitator of innovative projects concerning people; Matteo Sarsana, country manager of Deliveroo, one of the main Italian firms of food delivery; Stefano Polato, star chef and author of many books of receipts and finally Michele Festuccia, country leader of the firm Cisco Systems.

The third edition of Active Learning Lab about Design Excellence and Made in Italy hosted four experts: Marco Vettiol, professor at University of Padua; Filippo Giovanni Maria Carraro, administrator of Carraro Still and Technology since 2002; Alessandro

[70] "Scrum is a framework for managing software development. It is designed for teams of three to nine developers who: break their work into actions that can be completed within fixed duration cycles (called "sprints"), track progress and re-plan in daily 15-minute stand-up meetings, and collaborate to deliver workable software every sprint.[1][2] Approaches to coordinating the work of multiple scrum teams in larger organizations include Large-Scale Scrum and Scrum of Scrums, among others". Retrieved from: https://en.wikipedia.org/wiki/Scrum_(software_development)

Busana, designer and founder of Hall Design and winner of Good Design Award 2004 and, lastly Massimiliano Franz, head of communication of Carraro Group.

4. The Impact of Active Learning Lab

In this chapter, we have analysed the effects of Active Learning Lab by using a set of twenty-two former participants, with a Master's degree study or a specialization in scientific or humanistic areas.

The research was carried out accounting interviews, each one consisting of a minimum of four, up to a maximum of eight questions, according to the respondent and whether he had worked or attended a humanistic studies course.

Subsequently, to perform the analysis, all answers were split into four clusters. This study has been driven to scan whether either technical or teaching competencies, acquired during the Lab activity, have been useful or usable in the world of work as well in the humanistic area.

4.1 Interviews structure

During the month of September 2017, I interviewed a given of twenty-two former participants to the last editions of Active Learning Lab, with the aim to outline its impact and effects on students. I have undertaken a qualitative analysis, thus I asked to the interviewers to give consistent examples of experiences carried out after the attendance at the workshop. The sample I examined is extremely variegated, indeed participants to the last three editions of Active Learning Lab came from different fields of study, such as: Marketing and communication, Economics and Management, International Management, Managements of fine arts and cultural activities, European Literature and Languages of Post-colonial America, Literature, History, Archeology, Comparative International Relations. Every interviewer was asked to answer to a minimum of four and a maximum of eight questions. The first four were posed to everyone indistinctively:

1. After Active Learning Lab, did you start to face problems or finding solutions in a different way? If yes, can you please give examples of it?
2. Which skills did you acquire during Active Learning Lab? Can you please give examples of events or situations of everyday life in which you have seen a real improvement of your abilities?
3. After Active Learning Lab, did you deepen Design Thinking approach? Do you think you would apply this approach also to other fields? If yes, in which fields? If not, why?
4. Do you think this experience have had an impact on your personality? If yes, How? Can you give me an example?

These questions have been posed to participants in order to outline what are the main transversal skills they acquired during the workshop. Moreover, it was expected to understand if design thinking has effectively led to a real impact on their everyday lives, especially in the way they face challenges and find solutions to them. The last question has been posed because participants of Active Learning Lab are part of a multidisciplinary group made up of people with different backgrounds; hence, students had to adapt to one another, in order to solve the design challenge.

The other eight questions have been posed only to those who found a job after the experience of Active Learning Lab or to participants who got a job interview:

1. Do you think your employer has perceived the skills you have acquired during the Active Learning Lab? If yes, which? Can you please give me an example of a particular situation during which these skills have been appreciated by your employer?
2. During your job interview, did you enact the skills acquired during the Active Learning Lab? Can you tell me a specific moment when you realized you were enacting the skills acquired?
3. During your work experience, which skills acquired during the Active Learning Lab did you enact? Can you talk me about some specific episodes?
4. After this experience, what do you think about concepts like: human centered approach, empathy and creativity? Do you think they are useful in the working life? If yes, why? Did you enact these concepts? When?

The first question and the third one have been posed to understand how many students after the Active Learning Lab experience have found a job and to verify if the skills acquired had been noticed by third parties, such as: tutors or employers. The second question has been posed to figure out if these skills had been useful during a job interview and if the HRs of firms had considered them as a plus for the candidate. The last question has been important to see if the three main characteristics of design Thinking: empathy, creativity and the human-centered approach are useful and applicable within the working world and to understand if the interviewers have experienced a specific situation in which they have had the possibility to enact them.

Finally, the last three questions have been posed only to those who have attended a master's degree in humanistic studies, who after the workshop did not have job experiences:

1. After the Active Learning Lab, did you have the opportunity to be more interested in the economic world? If yes, tell me about your experience
2. Do you think that this workshop has helped you to bridge the gap coming from your humanistic studies? Do you think it had enabled you to enter in the economic field?

3. After the Active Learning Lab, have you ever thought to apply the skills acquired during the workshop in your field of study? If yes, which one? If not, why?

Most participants in the workshop came from humanistic studies and did not have economic expertise. I decided to pose them these questions to understand if their expertise in economics had increased. The last question had the aim to see if the skills acquired during the workshop could be applied in the humanistic field. This question also helped me to prove the importance of the workshop in terms of expertise for students who got their master's degree in humanistic studies.

The following paragraph will be focused on the answers I collected from the interviewers through four different clusters: skills, behavior, work and humanistic studies, with the aim to highlight the usefulness of the workshop, as well its effects on students who attended the Active Learning Lab.

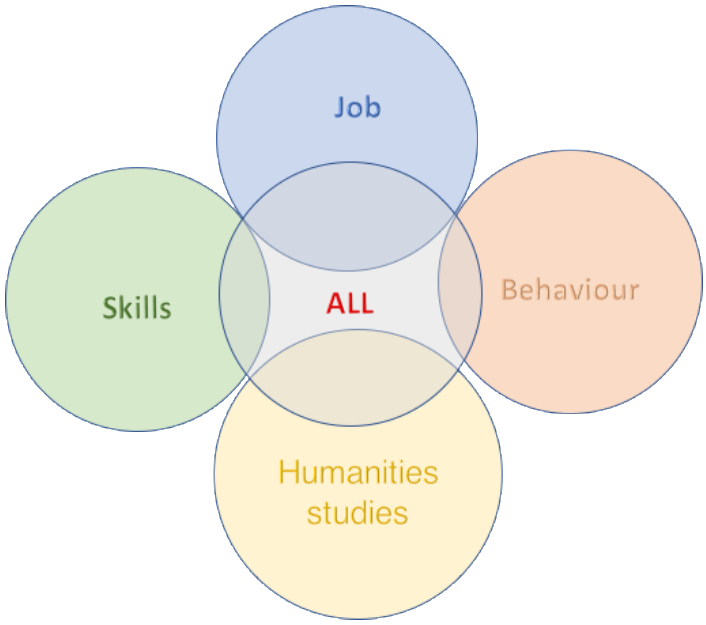

Figure 24 Analysis of interviews. Personal creation

4.2 Skills

This cluster is divided into four areas based on the answers given by interviewers to the first four questions. In this way, it is possible to have a clear idea of the skills

interviewers acquired after the Active Learning Lab and if they started to apply an innovative approach in their everyday life.

According to the results of interviews, 19 interviewers out of twenty-two have changed the way they solve a problem or a challenge; the three former participants in the workshop who did not change their approach come from humanistic studies. To this regard, they answered that, to solve a problem, they did not follow a specific method composed by determined steps but they prefer to find a solution through trials. This is what the interviewer I. answered:

"*No, the method I adopt to solve a problem did not concretely change after Active Learning Lab. When I find myself facing a problem, the first thing I do is trying to select all the possible ways and then I go through trials. I do not like to strictly follow only one method. In my opinion, chaos can suggest me the best solutions to apply.*"

However, most of interviewers, after Active Learning Lab, started to enact new means to solve challenges both at working level as well as in their everyday life. For instance, most of them have adopted building blocks, design thinking and brainstorming: a powerful tool to find innovative ideas to solve a problem. The interviewer F., who comes from a master's degree in Classics affirmed she applied these tools every day.

"*Yes, I adopted a different approach to solve problems, for example when I wrote my essay to get into the Boarding School. I did not apply the entire Design Thinking approach but only brainstorming to catalogue my ideas. I started to attach post-it on the wall, then I divided them into areas and, In the end, I created a conceptual map*".

Furthermore, students who participated in the workshop introduced a phase of research and the management of creativity to solve their day-to day challenges. The stage of **research,** which consists in deepening a specific concept from different points of view, is both historical, because it considers events in chronological order, as well as environmental, it means it is based on the environment of the subject researched. The phase of research has been used by six of the twenty-two participants, all of them belonging to Economic studies. The latter has been applied both at University level, to solve easy challenges such as exams or the management of study, as well as at

working level. In this context, the student A., attending a master's degree in Innovation and Marketing at Ca' Foscari University affirmed:

"In my last work experience I learnt a lot of things like: competitive analysis, market research, etc. Currently I work in a firm and I did not take for granted all the notions acquired before. This is what Active Learning Lab taught me: we always need to see things from different perspectives in the phase of research and without taking for granted all the skills acquired. We do not have to skim the surface, we need to deepen the things we deal with".

An important aspect to highlight is that Active Learning Lab teaches to students that creativity is not an innate ability but something to cultivate and stimulate every day
On this subject, one of the participants claimed as follows:

"*Yes, definitely this workshop helped me to understand that creativity is not a chaotic flux; it is however determined by its rules and a specific timeline. Indeed, it is necessary to follow a series of steps to make creativity lead to a substantial result. This is something that really impressed me. Before Active Learning Lab, I did not know that creativity derived from a methodology. What written above is to state that now I always try to face problems through creativity*".

It is the same for G., who thanks to Active Learning Lab has learnt how to manage a creative process:

"*Thanks to ALL now I know how to manage a creative process. In my opinion, the part of the workshop dedicated to creativity has been the most interesting. Before then, I knew what a brainstorming exercise was but now, thanks to this workshop, I have better learnt which tools I can use to implement/invent/solve problems. Today, not only do I know how to manage a creative process, but I am also aware of how to do it without wasting time*".

And he goes by saying: "*Active Learning Lab helped me to understand when to ideate and to converge, in order to achieve a specific goal*".

What is important to underline is the fact that Active Learning Lab provides students with exclusively new tools to face challenges as well as an innovative method to perform it, namely design thinking approach. Indeed, a big quantity of students, both from humanistic and economic fields of study, use it to solve their day-to day challenges, to write a dissertation or even only to solve work issues. Most of them go through all the stages of design thinking in a completely unconscious way, as for instance the participant F. who told me that*:*

"It happened that I found myself analysing a process at work and I have realized that I have totally changed the way I think and my approach to problem. For example, it happened that I was asked to divide the process into different moments and to understand the best frame of these moments in order to achieve a precise goal. The way I did it has been extremely influenced by design thinking, in a total unconscious way".

The major part of the interviewers affirmed they have used it without following all its stages. Basically, they have readapted it to a certain context.

It has been showed that more than half of people who attended Active Learning Lab adopt a different approach to face challenges, especially at University level, in case group activities developing innovative ideas are requested. This is what the interviewer F. said about it:

"When I was in collegium, we wanted to improve our audience. For this reason, I suggested to follow some steps of design thinking to find innovative ideas"

None of the participants who affirmed to have adopted this methodology, concretely deepened it. Not because they were not interested in studying its application and its effects, but because they were still ready to apply it in a concrete manner. Hence, we can assume that Active Learning Lab achieved its goal: making students to learn innovative methods to solve problems with a few hours of lessons and a substantial portion of time dedicated to carry out tests and to apply the theoretical notions. The survey showed that the skills widely developed during Active Learning Lab are transversal abilities, such as **team building**. This skill, proved by the half of the interviewers, is the result of group works carried out to solve the design challenge.

Furthermore, the fact that groups were decided by the organizers, led students to develop also other complementary skills like: listening, flexibility and discussion. These are the words of E.:

"I think my team working skill improved through the contact with the members of my working team. Thanks to them I realized the importance of mediation between parties and the coexistence of different point of views. Before, I had an impulsive behaviour. Now, thanks to ALL, I stimulated my listening and reflective skills. Today, I always think before speaking".

Multidisciplinary among participants has also been a challenge for them, since they all had diverse backgrounds. This is what the interviewer G. affirmed about it: *"Team working has not been as easy as it seems because I worked with people who were not in line with my ideas due to our diverse backgrounds, in fact I felt more comfortable with people who attended Economic studies like me".* For instance, according to G., multidisciplinary led her to open herself to positive scenarios which would not be as visible and tangible without collaborating with different people.

"I am more open toward people who come from different fields of study, I learnt to relate with them in a more efficient way and with a wider ability to accept other points of view. It has been a real enrichment for me. Before I used to solve problems by getting in touch with people more similar and congenial to one another, both in terms of competences and skills. Now, I realized that in a variegated team there are more opportunities to develop creativity and finding solutions..."

Working in multidisciplinary groups highlighted the importance of communication among participants. Let's read what F., a student belonging to humanistic studies, reported about it:

"I learnt how to relate myself to people who have a different academic background. Hence, I found myself converging my ideas whereby they could result convincing from the point of view of communication".

In this respect, a quarter of interviewers affirmed the most important skill has been **communication.** This analysis suggests that participants attending humanistic

courses have considered the word “communication” as an improvement of certain tools with the aim to achieve efficient results. The use of power point to create powerful presentations is a remarkable example of this. These are the words of the participant C. *“Now I can firmly affirm to have acquired competences in the use of Power Point for the elaboration of graphs. Before, I had no idea of how I could do that”*. Anyhow, not only technical expertise students from humanistic fields have affirmed to have improved but also a great confidence to destroy the wall of their difficulty of communicate which led them to enhance their skills in public speaking. This is supported also by the fact that more than half of people attending humanistic studies decided to present the project in front of an audience during Active Learning Lab.

Moreover, there are also other soft skills like: **problem solving, stress management and spirit of enterprise** which emerged over the course of the Blue-Wave activity, during which participants were called to solve a design challenge by 30 consecutive hours of time. All these skills have particularly interested students with a humanistic approach who were not used to work under pressure and to deal with subjects they had never managed before. This is what the participant E. affirmed: *“I had never worked under pressure”.* However, according to other participants who shared the same academic background with E., working in this way is extremely stimulating and it makes problem solving increase, a skill generally not developed in people attending humanistic studies. In this regard, having a spirit of enterprise is fundamental for those who carry out group works. Here the testimony of F.:

“One of the skills I acquired is spirit of enterprise. I have always been a person who, in case of group activities, did not like to be in the limelight but, thanks to the experience of ALL, I realized that even only one single idea can give a big support to the achievement of a goal. For example, during ALL, my team and I had to develop a project for a 3.0 room in the school of Piombino Dese, for Stevanato firm. At the beginning, I was loath to get in the game but at a certain point, I started to give my contribution to the team and, in that moment, the idea of the electronic register is born and it has been crucial to solve the challenge”.

This skill emerged also in other interviews, due to the fact that during ALL, people are exhorted to not be afraid of being judged and to be more self-confident. Indeed, the watchword of the workshop is: every idea is a good idea, in the phase of ideation.

During Active Learning Lab, students are taught how to express and materialize ideas. Four interviewers out of twenty-two, all attending Economics studies, recognized the ability to implement mockup as a new expertise. Here the testimony of the interviewer A. who claimed:

"I think that one of the most important skills I have developed during the workshop is prototyping, it means making an idea something tangible and concrete. Basically, it consists in the switch from an idea to a prototype, it is the conversion of an idea into a solution. I realized it during the challenge given by the firm Y. when I my idea turned into a top for a thermos".

In this case, A. could create mockups and prototypes at work. She goes on: *"I've realized that prototypes and mockups are crucial. Now that I work in the development of firm's products, it is fundamental to understand how a product can be implemented by drawing in on a paper. It makes me seeing how that product results if placed on a shelf of a supermarket. Today, after Active Learning Lab, I always try to make my ideas real."*

As it resulted in the interviews, most of the participants changed their approach to solve a problem, thanks to the tools they deepened during ALL, such as: creativity, brainstorming and design thinking methodology. Meanwhile, they acquired new transversal skills such as: stress management, team working, problem solving and public speaking as well as: prototyping, creation of mockups and presentations.

4.3 Behaviour

The second cluster is about the behavior of the participants of Active Learning Lab. In order to create it, I have analysed the answers participants provided after the first block of four questions. In this respect, most of them declared to have changed/strengthen some aspects of their behavior. This happened thanks to the application of design thinking methodology which requires the presence of multidisciplinary work groups and, at the same time, it provides a concrete method to solve problems. Therefore, multidisciplinary groups and the use of a specific methodology to solve challenges, led students to develop self-confidence and to

strengthen some aspects of their behaviors. This means to trust defeats and to be more flexible, so that listening and discussing are necessary for a successful work group and help to create innovative solutions. Here what the interviewer E. affirmed about it:

"My behavior has pretty changed after the workshop, even if, usually, I am an open person. I have always had the will to gain new experiences which made me explore new things which otherwise I would never have the opportunity to get to know. During ALL I have strengthened my open-mindedness and flexibility. It encouraged me to relate myself to others, to create, to find original ideas and, at the same time, it gave me the energy to walk on this path with enthusiasm".

The concept of open-mindedness has been reported even by the interviewer AL., who declared to have strengthen also other aspects of his character:

"From the behavioral point of view, I can say that my approach toward people with different backgrounds has changed. Today I am more confident about decisions coming from people who attend humanistic studies while yesterday I had more prejudices. This workshop made me realize that not only those who come from the economic field can successfully carry out interviews and meet firms but also students with a humanistic background can do that. In this regard, it has to be said that people with this academic profile have a more developed ability to communicate and to establish a relation with third persons. So, now I know that a different vision from mine is always useful".

He goes on: *"Active Learning Lab made me feel more confident to face new projects and to generate innovative solutions. These skills can be useful to everyone in everyday life".* T

The concept of confidence has been underlined also by other interviewers, like G who, during the interview, said:

"*Thanks to design thinking I feel more confident when I find myself dealing with subjects I don't' know. Whatever happens, I am sure that I will find a solution to every challenge*".

In this way, participants can recognize their strengths and their weaknesses and, at the same time, they can better feel their attitudes. An example is the interviewer F. who realized to have the role of the leader within her group. However, according to other participants, self-confidence and trust are not indispensable qualities only to achieve a result but they are at the basis of our day-to day life. This is what A. said: "*My behavior has changed because I started to assert myself. I used to be a too condescending girl who rarely takes her position but, thanks to Active Learning Lab, I had the chance to exteriorize my ideas*".

Hearing and understanding others are at the basis of Active Learning Lab whereby students are always urged to understand what commissioners of the design challenge request and to elaborate the right questions to stakeholders in order to get as much feedback as possible. In this context, empathy is the key word to understand someone else's points of view by making them feel comfortable expressing their opinions. This is a skill that the participant P. affirmed to have developed during ALL:

"Before, I could be perceived as an arrogant and presumptuous person but then I learnt to mediate among the members of the group and to accept ideas completely far from mine. Now, I always try to find a middle-ground between me and the others while before I always tried to impose my point of view".

However, hearing also means to be human-centered. In support of this, the interviewer F. affirmed:

"I have really learnt to understand what people tell me. Active Learning Lab helped me to pose the right questions to the right person. For example, If I have questions at work, I directly go to the specific referent instead of my tutors, in order to receive an adequate answer. This led me to conclude that if I pose a question in a certain way and to a specific person, I can obtain different results on each occasion".

4.4 Job

This cluster is referred to the second slot of four questions submitted only to those interviewees who worked after the Active Learning Lab. This analysis was carried out in order to understand whether the skills and notions taught during ALL were useful and usable during work and / or interviewing, as well as to verify whether they were noticed and appreciated by tutors or employers. This would help to understand the impact of the lab in the student's workflow.

Students who had an interview after the Active Learning Lab were sixteen out of the twenty-two interviewees, of whom fourteen from economic studies and two from humanistic areas.

All respondents, who have held at least one interview, have included the experience of the lab in their curriculum vitae; in fact many of them discussed this experience during the interview, always receiving positive feedback from the companies, as the interviewee reported.

Half of those interviewees after ALL worked: a quarter from humanistic studies and more than half from economics. This was due to the compulsory curriculum stage during the courses in Economics

At: *"During the interview I played a lot on the ALA and I received positive feedback, because they kept on questioning me the following: what has it left to you? What skills have you learned? Which was your role within your team? Through these questions, I was able to laud my ability to work in team, because I was collaborating with people who had not been chosen by me."*

The same thing happened to interviewed M. who had an interview with a famous company settled in Veneto. During the conversation, she did not explain what the course was about, but the company was already familiar with the ALL. In fact, she reported:

"*I went to the interview and they (the company) noticed that I had been through the ALL with me saying anything, and they asked me which role I played in the group, and*

many more questions related to the ALL. Now the Attractive Learning Lab's attendance is increasingly considered as a plus within a curriculum! "

According to the interviews, several companies also have a strong interest for the Design Thinking method. The interview V. reports: "*For example in the last interview I held, in the first step I had to develop the idea of a new product, and in order to realize it I used the Design Thinking method. The company appreciated the result and, at the same time, they asked me to provide more information about that methodology*." The same curiosity for the ALL and the Design Thinking was noticed by the interviewee G., who held an interview for an Amsterdam-based company. Even in this case, the company in question did not know the methodology and they submitted many questions to understand more. According to the interviewee's report, this was one of the reasons why she had been selected.

Two of the interviewees, one from Economics area (A) and one from Literature (B), not only explained what the ALL was about, but they also had different approaches to job interviews; for example, the interviewee A exposed himself not underlining his competences, but describing his values and his transversal skills. Instead, the interviewee A the Human-Centred approach during the job interview:

"*During the interview, they could recognize the competences I had learned thanks to the ALL, for example the ability to understand what the person who was hiring me wanted and to provide the right solution. ALL taught me how to identify myself with the individual in front of me; during the interviews, it helped me to select the skills to present (the interviewers listened to me for s minute and then their concentration decreased); thanks to the ALL I have been able to select the information the interviewers wanted to hear from me*."

On the contrary, two other interviewees used the skills assumed in the laboratory during the interview phase. For instance, the interviewee A declared:

"I used the skills of the Active Learning Lab during the interviews, especially with regard to the market analysis phase. In fact, before proceeding with an interview I go to the point of sale reference, looking on the field and trying to understand how it works. In this way, I can enter into / identify myself with the consumer and eventually I realize

a historical and market research on the company where I'm going to hold the interview, as when we were working for Favini. This was widely regarded by one of the two companies I worked for as one of the main reasons for my recruitment. Also in one of the two talks that I held I did the staple experiment I had already done at the ALL, so I was super prepared! "

The last testimony concerning an interview comes from the interviewee AB, which encapsulates most of the concepts expressed in the previous interviews.

"*During the interviews, I always showed the ALL, both by methodology used in the laboratory and to expose my skills as the ability to work in team, skill that is always highly appreciated by companies. There are two examples through which I have been able to expose the skills learned in the Active Learning Lab, both examples refer to a talk I have held with a large multinational corporation. The first example is when I was asked to find out how many cars were sold in Italy and I could only get the answer by asking three questions to a person; in this case I managed to get to the solution thanks to the techniques used in doing an interview and learned in the ALL. The second example refers to a group interview, in which we had to solve a challenge in team with other people: I was able to relate well with everyone to find the solution, thanks to the ability of reading the problem as I was taught in the " ALL.* "

More than half of respondents were able to highlight the skills and soft skills developed during the ALL and at the same time these were noticed by their tutors / employers.

From the research carried out, the theoretical knowledge learned in the laboratory does not emerge in any case, but only the transversal ones. Much of these skills derive from the Design Thinking approach, such as the ability to analyse a certain context from multiple perspectives so as to have an overview, as reported by the interviewed C and D, both coming from study areas economic.

For example, the interviewee C. recounts a working episode in which the use of an overview was well appreciated by his employer:

"[...] *My employers have been able to see the skills I have assimilated during ALL, for example, an episode showing my soft skills of the overall vision, has been*

highlighted a few weeks ago. In the enrolment office where I was working, there was a practice to be addressed that was to be refused because it did not respect the criteria and rules laid down for the assessment. However, according to a general view and having a bit of common sense, the practice could be accepted. I subsequently submitted it to my manager and the practice has been approved instead of being rejected, changing the final outcome. My manager congratulated me for not having made it a priori and this was only possible thanks to the overall vision, soft skill developed in the ALL."

The testimony of the interviewed D. is also based on the ability to use overview and how this is usually completely distant for an economics student. "*One skill that my employer has perceived is the overall analysis of what the problem is; while having an economically basic approach, where they teach us that you have to go from point A to point B to follow a linear path, through the lab I have been able to implement this skill so you can consider different aspects and not just go straight to point B*."

As in the interview phase, the soft skill emerged for the half of the respondents is the use of the Human-Centred approach, so the ability to empathize with a subject you do not know and at the same time understand its real need. Concerning the use of this approach, two different work episodes have emerged. The first refers to the use of this approach to resolve a business challenge as the interviewee E tells us:

"*A skill I hired through the ALL is to identify myself in the consumer, not just stopping at a market analysis - a commonly used approach in marketing but trying to go further. This approach was perceived by my tutor during a project in which we had to conceive public streetlights for a square in Treviso. On one hand, my first thought was directly addressed to the quickest solution to illuminate a night square, while, on the other hand, I tried to understand, to observe, and finally to imagine myself to put in those people's shoes attending that square every day. From this analysis, I realized that people in the square had bored expressions on their faces, so the solution was not only to enlighten the square but to make it a living place and I proposed to my tutor to install colourful lights to create a more joyful atmosphere. This observation has been greatly appreciated by my tutor who has proposed it directly to the client as a possible solution*. "

The interviewee D. used this kind of approach to get the job position she desired:

"*Yes, they have absolutely captured my skills and I'll tell you why, since those skills already belonged to me, but in my opinion, it has been fundamental to put myself to the test: the job position I was applying to was a different one, but in the end, I hired to do what I initially wanted to, by opening a suitable position for me because during the interview I showed to know how to relate in the right way towards other people. Such skill I developed during ALL*. "

Other skills related to Designing Thinking emerged during the interviews and noticed by employers are: initiative spirit, confidence in bankruptcy and the development of the ability of reason systematically.

From the interviews, it can be seen that the major technical skills learned at the Active Learning Lab and used in the field of work are those of research, prototyping and mock up; while all the transversal skills stimulated within the lab have been decisive both in the working and interviewing stages. The most re-utilized competence is the Human-centred approach that allowed respondents to understand what the interlocutor (the company) really wanted to provide the best possible solution.

4.5 Humanities studies

This cluster is the result of the third block of questions addressed only to participants, attending humanities studies. The aim was that to understand if these students had improved their expertise in the Economic field to the point that they could turn these skills in their academic studies. In this regard, seven students out of eight affirmed to have acquired knowledge in the economic field, useful for their future. However, these participants approach to this new and complex subject in several ways: some of them reading newspapers, others taking part to “Hackatons” requiring Economic expertise, while another part of them directly started to work in the economic field. Here what the interviewer E., attending a master’s degree in European languages and literatures of post-colonial America, reported about it:

"Yes, I started to be more interested in Economics, in fact I submitted many applications to several firms. For example, I sent my CV to a marketing agency. I think I would have never done that if I had not had the chance to take part in Active Learning Lab. Thanks to ALL I feel more prepared about Economics".

In support of this, the student F. affirmed that after Active Learning Lab she decided to fund a start-up:
"After ALL I decided to fund a start-up based on a multidisciplinary team because I realized that working in a team composed by people with divergent backgrounds is necessary to achieve successful results". She goes on: *"Thanks to ALL, now I feel more comfortable in the Economic world, especially from the conceptual point of view".*

Another participant, attending a master's degree in Political Science, declared to have developed an interest in Economics to an extent that she ended up writing a dissertation on this subject.

However, an important aspect to highlight, is that the interviewed students with a humanistic profile, found out that the skills acquired during Active Learning Lab could be applied to their work, concerning their academic field. Most of them are employed as teachers and educators or intend working in this sector. Here the testimonies of the interviewers G. and F., an educator and an aspirant teacher respectively. This is what G. declared during the interview:

"I am an educator and I am always asked to find solutions. During the interview to apply for this job, employers told me that the position I was running for was something new also for them. They expected that the new applicant was someone who could rapidly find the right solution in critical situations autonomously. Thanks to Active Learning Lab I did not find it impossible or scaring… In my position, I must constantly understand students and their parent's needs. If I had not participated in ALL, probably I would have never acquired the necessary skills to work in this environment".

These are the words of the interviewer F. who said:

“Transversal skills acquired during ALL, such as empathy and decision-making under pressure can be very useful in the field of education (my dream is to become a teacher). Without this experience, I would have never acquired these skills due to the fact that in my master’s degree I would have never had the opportunity to enact them”.

Moreover, from the interviews, it resulted that people attending fine arts degrees are more prepared in terms of expertise when they meet firms, especially if they have taken part in Active Learning Lab. Here the last testimony of the interviewer H. who has been hired by one of the firms involved in the workshop:

“I bring with me and in my job, values like human-centred, empathy and creativity every day. I have been hired by a firm which did not have a marketing area before my recruitment. So, I was asked to fund and manage it and, in order to be as successful as possible, I decided to apply design thinking approach to face every challenge of this sector”.

Conclusion

As former US President Obama announced in 2009, nowadays students need skills such as problem-solving, creativity and critical thinking; the same abilities have been developed within the Active Learning Lab.

As noted through the interviews, the effects of the lab were various, some more obvious, others less tangible. All interviewees have internalized the essence of Design Thinking, taking it with them in their future work. Analyzing the interviews, I can state the features of Design Thinking that had a strong impact on the sample I observed, that is to say: the **Human-centered** approach which helped the participants, both during the interview and in the working stage, as this made them understand the actual companies needs and teamwork process through wider empathy, accepting other people's views; **creativity** and flow management, in order to make it an effective problem-solving tool, and finally the **multidisciplinary** of the groups developed in participants in terms of better listening skill and flexibility, increasing self-confidence and self-awareness, as well as the capability to have an overview; thanks to the comparison between the participants, having different backgrounds, strengths and weaknesses points have arisen.

Many of the respondents, who worked after the Active Learning Lab, were able to show the skills learned in the lab and, some of them, were particularly appreciated by their employers, for instance: the ability to translate an idea into a physical object (prototyping stage in Design Thinking), overall view acquired along with understanding the importance of the research phase. The analysis shows that the close relationship between young people and businesses, led to enter the world of work; in fact, some of them had the opportunity to collaborate afterwards with the companies that participated in the Active Learning Lab and, as a result, this last one became the subject matter for some venetian multinational companies during the interview. Simultaneously, proximity to companies allows participants to break the wall of fear that is built up during business talks, once they have developed deeper knowledge and confidence.

Moreover, it was found that participants coming from humanistic fields, following lab attendance and approaching the economic way, claimed that the gap between these two different fields of study had diminished, as they feel more comfortable now in

dealing with macroeconomics concepts and for the skills acquired transferable to their humanistic sphere of study.

In a context where innovation is one of the factors to generate a competitive edge, Active Learning Lab, in particular thanks to the use of Design Thinking methodology, enables participants to develop innovative solutions needed to enter the world of work and, at the same time, to understand it.

In my opinion, The Active Learning Lab is a good example of innovative teaching and it would be desirable to introduce Design Thinking methodology not only within a course or laboratory, but also in training paths at University, by using it as much as didactics to equalize students in the ongoing evolution of market.

Bibliography

- Acklin C. “Design-Driven Innovation Process Model”, Design Management Journal, vol. 5, pp 50-60, 2010
- Alves J., Marques M. J., Saur I. and Marques P. “*Creativity and Innovation through Multidisciplinary and Multisector Cooperation*”, Creativity and innovation management, vol. 16, pp. 27-34, 2007
- Bauchanan, R. “Wicked Problems in Design Thinking”. Design Issues; Vol. 8, No. 2, pp. 5-21, 1992
- Boland, R. J. & Collopy, “*Managing as Designing”*, Stanford Business Books, Stanford, 2014
- Brown T. “*Design Thinking*”, Harvard business review, June, pp. 1-10, 2008.
- Brown, T. “*Change by Design: How Design thinking Transforms Organizations and Inspires Innovation* ”, HarperCollins, New York, 2014
- Brown, T. and Wyatt, J. “*Design thinking for Social Innovation*”, Stanford Social Innovation Review, Winter, pp 30-35, 2007
- Buchanan R. “*Wicked Problems in Design Thinking*”, The MIT Press,1992
- Buchanan, R. “*Introduction: design and organizational change*”, Design Issues, pp. 24-91, 2008
- Calcagno M. “*Narrare terre di mezzo. Management, arte e design*”, Editoriale scientifica, Napoli, 2013
- Cooper R., Junginger S. and Lockwood T. “*Design Thinking and Design Management: A Research and Practice Perspective*”, Design Management Review 20.2, 2009

- Cross N. "*Design Thinking: Understanding How Designers Think and Work*." Berg, Oxford, 2011
- Cross N. "*Designerly ways of knowing: design discipline versus design science. Design Issues*", 17(3) pp. 49–55, 2001
- Cross N. "Design Thinking as a form of intelligence", Design Thinking Research Symposium, 08, at Delft, Netherlands, 2008
- Cross, N. "*Engineering design methods-strategies for product design*", John Wiley & Sons, England, 1998
- Developing Design Thinking Expertise in Higher Education, Andrew WITHELL, Dr. Neil HAIGH, 2nd International Conference for Design Education Researchers Oslo, 14–17, May, 2013
- Goldman S., Carroll P., Kabayadondo Z., Cavagnaro L., W. Royalty A., Bernard Roth, Swee Hong Kwek, and Kim J. "*Assessing d.learning: Capturing the Journey of Becoming a Design Thinker*", Springer, 2010
- Graham W. "*The art of thought*", Harcourt, New York, 1996
- Johansson-Sköldberg U., Woodilla J. e Çetinkaya M. "*Design thinking: past, present and possible future*", Creativity and innovation management, 2013
- Kelley T. and Kelley D. "*Creative Confidence*", Crown Business, New York, 1967
- Kelley, T., Littman, J., "*The Ten Faces of Innovation: IDEO's Strategies for Defeating the Devil's Advocate and Driving Creativity Throughout Your Organization"* Random House, Chicago, 2005
- Kotler, P. and Rath, G. "*Design a powerful but neglected strategic tool*", Journal of Business Strategy, 5, pp. 16–21, 1984

- Krippendorff K. "*The Semantic Turn. A New Foundation for Design*", CRC, Press, Boca Raton, FL, 2006
- Krippendorff, K. "*On the Essential Contexts of Artifacts or on the Proposition, Design Is Making Sens (of Things*)". Design Issue, v. 5, pp. 9-38, 1989
- Kurokawa T. "*Design Thinking Education at Universities and Graduate Schools*", Quartely Review No.46, February, 2013
- Kwek, S.H. "Innovation in the Classroom: Design Thinking for 21st Century Learning. (Master's thesis)", Retrieved from: http://www.stanford.edu/group/redlab/cgi- bin/publications_resources.php,
- Lisa Phillips, "*Assessment towards Innovation: Examining Feedback Methods in the Design Studio*", Athens Journal of Humanities & Arts, January, 2014
- Lockwood T. "*Design Thinking: Integrating Innovation, Customer Experience and Brand Value*", Allworth Press, New York, 2010
- Maldonado T. "*Disegno industriale: un riesame*", Feltrinelli, Milano, 1991
- Martin R. and Dunne D. *"Design thinking and How It Will Change Management Education: An Interview and Discussion*", Academy of Management Learning & Education, vol. 5, pp. 512–523.
- Martin, R. "*The Design of Business: Why Design thinking is the Next Competitive Advantage*", Harvard Business School Press, Boston, 2009
- Melles, G. "*Curriculum design thinking: a new name for old ways of thinking and practice?*", Proceedings of the DTRS8 Conference, UTS, Sydney, pp. 299-308
- Norman A., Verganti R. "*Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change*"

- Plattner,H. Meinel, C., Weinburg, U. "*Desing Thinking*", Munich, mi-Wirtschaftsbuch, 2009
- Rhodes, M. "*An Analysis of Creativity*", Phi Delta Kappa, 42, pp. 305–310, 1961
- Richard J. Boland, JR. and Collopy F. "*Managing as Designing"*, 2004
- Rittel H. W. J "*Wicked Problems*", Management Science; vol. 4, pp. 141-142, 1967
- Scheer A., Noweski C., Meinel C. "*Transforming Constructivist Learning into Action: Design Thinking in education*", Design and Technology Education: An International Journal, 2012
- Schön, Donald A. "*The Reflective Practitioner: How Professionals Think in Action*". Basic, New York, 1983.
- Simon, H. "*The Sciences of the Artificial"*. Cambridge, MIT Press, 1966
- Skogstad P. Leifer "*L. A unified Innovation Process Model for Engineering Designers and Managers. Design thinkink – Understand – Apply –Improve*", 2010
- Sutton, R. I., & Hargadon, A. "*Brainstorming groups in context: Effectiveness in a product design firm*", Administrative Science Quarterly, 41(4), 685–718, 1996
- Teal R. " *A (non-linear) practice of design thinking*", The International Journal of Art & Design Education, 29(3), 294-302, 2010
- Verganti R. "*Design-driven Innovation: Changing the Rules of Competition by Radically Innovating what Things Mean*", Harvard Business Press, Boston, 2009.

- Verganti R. *“Design, meanings, and radical innovation: A metamodel and a research agenda*”, Journal of Product Innovation Management, 5, pp.436-456, 2008
- Verganti R. “*Innovating through Design”, Harvard Business Review”*; 84(12); pp.114-122, 2006
- Verganti R. “*Innovazione, design e management. Strategie e politiche per il sistema-Piemonte*”, Politecnico di Milano, Harvard Business School, Ottobre, 2008
- Wastell D. “*Managing as designing: implications for management education and research*”, March, 2012

Sitography

- . (n.d.). Retrieved July 17, 2017, from https://www.fastcodesign.com/1663558/design-thinking-is-a-failed-experiment-so-whats-next
- (n.d.). Retrieved August 14, 2017, from https://designthinking.ideo.com/
- (n.d.). Retrieved August 14, 2017, from https://www.csun.edu/~vcpsy00h/creativity/define.htm
- (n.d.). Retrieved August 20, 2017, from http://www.cindytripp.com/announcements/innovation-design-PG-changes-its-game
- (n.d.). Retrieved July 16, 2017, from https://designthinking.ideo.com/?tag=design
- (n.d.). Retrieved May 26, 2017, from http://dschool-old.stanford.edu/groups/k12/wiki/17cff/Steps_in_a_Design_Thinking_Process.html
- (n.d.). Retrieved October 08, 2017, from http://listings. 0.com/l/26690706/Madinitaly-Llc-in-Miami-Beach-FL
- (n.d.). Retrieved September 01, 2017, from https://www.csun.edu/~vcpsy00h/creativity/define.htm
- (n.d.). Retrieved September 04, 2017, from https://designthinkingforeducators.com/about-toolkit/
- A New Way to Vote for the People of Los Angeles. (n.d.). Retrieved July 2, 2017, from https://www.ideo.com/case-study/a-new-way-to-vote-for-the-people-of-los-angeles

- A place for explorers & experimenters at Stanford University. (n.d.). Retrieved July 08, 2017, from https://dschool.stanford.edu/
- About IDEO. (n.d.). Retrieved May 13, 2017, from https://www.ideo.com/about
- About Us. (n.d.). Retrieved August 4, 2017, from https://www.airbnb.com/about/about-us
- About. (n.d.). Retrieved June 22, 2017, from http://www.kalliste.it/en/about-us-2/
- About. (n.d.). Retrieved September 26, 2017, from http://moroso.it/azienda/?lang=en
- Arianna is specialized in the design and manufacture of LED lighting systems. Our luminaires are conceived for street, public and industrial LED lighting. (n.d.). Retrieved June 13, 2017, from http://www.ariannaled.com/en/
- Barrett, T. (2016, October 27). Applying Design Thinking in 4 Different Ways in Schools. Retrieved June 08, 2017, from https://medium.com/@tombarrett/applying-design-thinking-in-4-different-ways-in-schools-9ab7c9dd6826
- Brown, T. (2015, August 28). Design Thinking. Retrieved September 08, 2017, from https://hbr.org/2008/06/design-thinking
- Brown, T. (n.d.). Designers -- think big! Retrieved August 20, 2017, from https://www.ted.com/talks/tim_brown_urges_designers_to_think_big
- Brown, T. (n.d.). Tales of creativity and play. Retrieved October 02, 2017, from https://www.ted.com/talks/tim_brown_on_creativity_and_play
- Che cosa è il Design Thinking e come attuarlo in classe (in 6 step). (2016, April 05). Retrieved August 20, 2017, from

http://ischool.startupitalia.eu/education/53146-20160401-design-thinking-scuola

- Clarity Innovations, Inc. (n.d.). Retrieved August 12, 2017, from https://www.clarity-innovations.com/
- Company - Favini. (n.d.). Retrieved June 9, 2017, from http://www.favini.com/en/about-us/company/
- Company. (n.d.). Retrieved September 13, 2017, from http://www.ladonatella.eu/en/company
- Dam, R., & Siang, T. (n.d.). Design Thinking: A Quick Overview. Retrieved May 27, 2017, from https://www.interaction-design.org/literature/article/design-thinking-a-quick-overview
- David Kelley of IDEO talks. (2013, January 21). Retrieved October 08, 2017, from http://blog.ted.com/david-kelley-of-ideo-talks-design-thinking-on-60-minutes/
- Definitions of design thinking. (n.d.). Retrieved July 11, 2017, from https://designthinking.ideo.com/?p=49
- Design Thinking as a Strategy for Innovation. (n.d.). Retrieved July 14, 2017, from https://www.creativityatwork.com/design-thinking-strategy-for-innovation/
- Design Thinking for Educators. (n.d.). Retrieved May 09, 2017, from https://designthinkingforeducators.com/
- Design Thinking for Social Innovation (SSIR). (n.d.). Retrieved August 2, 2017, from https://ssir.org/articles/entry/design_thinking_for_social_innovation
- Design thinking. (2017, October 02). Retrieved October 08, 2017, from https://en.wikipedia.org/wiki/Design_thinking

- Elmansy, R. (2015, December 23). Can We Apply Design Thinking in Education? Retrieved July 03, 2017, from http://www.designorate.com/can-we-apply-design-thinking-in-education/
- Embrace | Design for Extreme Affordability. (n.d.). Retrieved July 15, 2017, from http://extreme.stanford.edu/projects/embrace
- General Information. (n.d.). Retrieved June 14, 2017, from https://hpi.de/en/school-of-design-thinking/for-students/general-information.html
- How Design Thinking Transformed Airbnb from a Failing Startup to a Billion Dollar Business. (2015, February 07). Retrieved September 05, 2017, from http://firstround.com/review/How-design-thinking-transformed-Airbnb-from-failing-startup-to-billion-dollar-business/
- How to apply a design thinking, HCD, UX or any creative ... (n.d.). Retrieved June 8, 2017, from https://medium.com/digital-experience-design/how-to-apply-a-design-thinking-hcd-ux-or-any-creative-process-from-scratch-b8786efbf812
- I've Moved! (n.d.). Retrieved August 08, 2017, from http://d20innovation.d20blogs.org/
- Improving Quality of Life for Young Adults with Schizophrenia. (n.d.). Retrieved June 1, 2017, from https://www.ideo.com/case-study/improving-quality-of-life-for-young-adults-with-schizophrenia
- Lean startup. (2017, September 30). Retrieved October 08, 2017, from https://en.wikipedia.org/wiki/Lean_startup
- Lego. (2017, October 04). Retrieved October 05, 2017, from https://en.wikipedia.org/wiki/Lego

- Merholz, P. (2014, July 23). Why Design Thinking Won't Save You. Retrieved August 17, 2017, from https://hbr.org/2009/10/why-design-thinking-wont-save.html
- Mindset. (n.d.). Retrieved June 6, 2017, from https://hpi.de/en/school-of-design-thinking/design-thinking/mindset.html
- Modernizing the Next-Generation View-Master. (n.d.). Retrieved June 6, 2017, from https://www.ideo.com/case-study/modernizing-the-next-generation-view-master
- Profile. (n.d.). Retrieved August 20, 2017, from http://www.stevanatogroup.com/en/identity/profile/
- Programs. (n.d.). Retrieved May 10, 2017, from https://dschool.stanford.edu/programs
- S. (2014, September 17). A Brief History of Design Thinking: The Theory [P2]. Retrieved September 10, 2017, from https://ithinkidesign.wordpress.com/2012/03/31/a-brief-history-of-design-thinking-the-theory-p2/
- Scrum (software development). (2017, October 04). Retrieved October 08, 2017, from https://en.wikipedia.org/wiki/Scrum_%28software_development%29
- Theoretical Foundations of Design Thinking Part I: John E ... (n.d.). Retrieved June 6, 2017, from http://thisisdesignthinking.net/2017/05/theoretical-foundations-of-design-thinking-john-arnold-creative-thinking-theories/
- Turnali, K. (2017, May 25). SAPVoice: What Is Design Thinking? Retrieved June 11, 2017, from https://www.forbes.com/sites/sap/2015/05/10/what-is-design-thinking/

- Unifarco | The house of more than 4.400 European pharmacies. (n.d.). Retrieved July 3, 2017, from http://www.unifarco.com
- What Is Design Thinking and Why Is It Important? - SAGE Pub. (n.d.). Retrieved July 12, 2017, from http://journals.sagepub.com/doi/pdf/10.3102/0034654312457429
- Wicked problem. (2017, October 07). Retrieved October 08, 2017, from https://en.wikipedia.org/wiki/Wicked_problem

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