cultart
cultural management academy

CULTART Training programme
Creative thinking for innovation

Training Module 8:
What is Design Thinking?

WHY DESIGN THINKING IS IMPORTANT

Sourse: https://www.indiatoday.in/education-today/jobs-and-careers/story/why-design-thinking-is-important-in-todays-job-industries-2406049-2023-07-13

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The CULTART training program has been developed as a blended training program, combining e-learning (independent study relying on online learning resources) and in- person classroom activities facilitated by a qualified trainer.

The units of this module are designed to provide learners with the most important insights regarding the subject matter of the module, in accordance with the findings of the analyses conducted in the framework of Intellectual Output 1 of the CULTART project.

The learning content provided here is intended to serve for independent learning and does not pretend to cover all possible aspects and related issues in terms of the subject matter covered.

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Content

Training description
Objectives of this training module
Target groups
Competencies and skills after finishing this module
Training method

Training content
Unit 1 Empathize
Unit 2. Define & Research
Unit 3. Ideate
Unit 4. Prototyping

Training description

Design thinking is adaptable and iterative, so it is incredibly useful for startups at all stages of development — whether you are just starting your business or if you have a successful product and business model.

Sometimes you do not know your exact problem. For example, if you are just starting out, you may have difficulty fully articulating your startup solution. Alternatively, if your business is further along, you may know that you have points of friction somewhere, but cannot fully identify them.

This blended training module reveals the design thinking methodology as a perfect approach for discovery — when you need to identify something you cannot verbalize. It is a systematic methodology that helps you identify your problem and come up with numerous creative solutions, so it is perfect for quickly and iteratively identifying how to solve problems.

It is also beneficial because you do not need to be a designer or have a designer on your team for this methodology. You just need to be open to the process, have a human centered and creative attitude, and an eagerness to identify creative solutions to a problem.

Objectives of this training module

This module illustrates design thinking as a powerful tool that fosters economic growth, innovations, identifying problems as well as creative goals. By considering design thinking as a process, the main focus is placed on one some of the most important aspects: how to effectively use empathy in design thinking, how to clarify the exact user needs and to place their focus on a certain problem, gettting familiar with some of the most popular methods of ideation, such as: brainstorming, braindumping, mindmapping, sketching and movement as well as prototyping. Furthermore, you will be introduced to some valuable tips and tricks that will help you to unleash your creative genius and come up with quick and effective solutions. This module will help you to understand the process of ideation as well as the development of products/services under constraints. In addition, you will gain an understanding of such popular design thinking statements as "Thinking Outside of The Box" and "Thinking Inside of The Box". Finally, we will be discussing the construction of a basic version of your proposed solution which enables you to demonstrate your idea in some tangible way, rather than just talk about it in the abstract.

Target groups

- Members and stakeholders which operates into CCI sector and fintech industry.
- CCI freelancers.
- Startups in CCI sector.
- Entrepreneurs that want to use creativity in their marketing and dissemination activities.
- Regional multipliers.

Competencies and skills after finishing this module

After studying this module,

- you will understand the nature of the Design Thinking process and sharpen your problem solving skills.
- you will be able to effectively develop innovative products and services by using the design thinking methodology.
- you will be able to motivate others to think and work more creatively and collaboratively. You will become familiar with applying techniques to help you and your team overcome common barriers to creativity.
- you will learn how to empathise and understand you client needs, define your exact problem, ideate, and make your idea tangible.

Training method

Cultart offers an interactive training approach, marked by the following aspects:

- Short-burst learning sessions with carefully structured and focused learning content.
- Modules conceived as training material for self-learning or for facilitated group training sessions with a professional trainer.
- Sense of control afforded to the learner through the transparency of the module structures and the practice-oriented tasks given at the end of the modules.
- Emphasizing the mutually reinforcing potency of awareness/knowledge and action.
- Valorizing personal involvement, commitment, and self-motivation.

Unlike traditional approaches based on face-to-face classroom teaching and regimented hands-on instruction, Cultart expects learners to take responsibility for time management and assume control over their own learning progress.

Training content

Unit 1 Empathize
Tags:
Design thinking. Define, research, creativity, empathize

Unit 1 - Introduction

This unit illustrates design thinking as a powerful tool that fosters economic growth, innovations, identifying problems as well as creative goals. By considering design thinking as a process, the main focus is placed on one of the most important aspects: how to effectively use empathy in design thinking. We will discuss the main benefits from utilizing different types of empathy as well as ask questions in order to empathize successfully. Several examples will be given in order to clarify the nature of empathy as a set of essential skills helping us to clearly understand the other party's feelings, emotions, needs and problems.

"You cannot hold a design in your hand. It is not a thing. It is a process. A system. A way of thinking."

Bob Gill, Graphic Design as a Second Language

Design is a complicated creative process and design thinking is present in each stage of the journey from client brief to accomplished work. Different solutions can be produced for any given brief and these can differ widely in levels of creativity, practicality and budget (Ambrose & Harris, 2010).

Design Thinking as a process

In today's highly competitive world, person needs to use a large number of skills in order to be outstanding and successful. One of these skills refers to the way of finding quick, effective and efficient problem-solving methods and it is called "design thinking". Design is a process that turns a brief or requirement into a finished product or design solution. The design process comprises five stages: define, research, ideate, prototype and test.

While creativity in design is important, design thinking is an activity that serves economic as well as creative goals. The process seeks to generate a number of possible solutions and utilises various techniques or mechanisms that encourage participants to think outside the box in the pursuit of creative or innovative solutions.

Use of Empathy in Design Thinking

Before we start with the process, we have to achieve a deep understanding of the people for whom we are designing (solving problems), by using empathy. Meriam-Webster defines in its dictionary ("Meriam-Webster", n.d.) the empathy as "*the imaginative projection of a subjective state into an object so that the object appears to be infused with it*". In order to create meaningful innovations, we have to know how our clients care about their lives.

In addition, there are three very useful questions that need to be considered in order to empathize successfully:

1. What is the client feeling?
2. What actions indicate those feelings?
3. How can we call those feelings with words?
4.

However, in order to be more specific and achieve excellent results, we can distinguish the following types of empathy (Gasparini 2015):

1. **Emotional empathy** – more specifically, it explains how a person feels what his/her clients experience (instinctive, affective, shared) on an emotional level. It enables a person to share the feelings of another person. This type of empathy is quite relevant when it comes to informal discussions of compassionate human behaviours. ("The Psychology of Emotional and Cognitive Empathy," n.d.). For example, this is a natural response that enable us to predict how exactly what emotions the other party experiences, to guess even some unspoken words and etc. The emotional empathy is a key skill in taking appropriate decisions.

Image 2. Emotional Empathy, Source: https://theconversation.com/europe/topics/emotional-empathy-31443

2. **Cognitive empathy** - a person gain understanding about how others may experience the world from their point of view. In other words, it refers to the way to understand your customer mindset. This type of empathy could be extremely helpful in negotiations, due to the fact we know what the other party wants. For example, your client company experiences severe financial problems. You remember you had already experienced very similar troubles, a few years ago. Instead of say something trivial like "Don't worry, everything will be fine", let him/her know you have a deep understanding of how exactly s/he is feeling right now. Based on your previous experience, talk about taking concrete actions and explain possible scenarios. Designers can use empathy to acquire insight into users' needs and in doing so, inform the design process.

Image 3. Cognitive Empathy
Source: https://blog.mindvalley.com/cognitive-empathy/

For instance, in a Design Thinking process all the participants in a design team need to be empathic with the users they are designing for in order to create relevant solutions. Using an approach toward cognitive empathy, designers apply different methods to build up that competence and insight, enabling them to prioritize the needs of the users and make the results of the process more desirable. Furthermore, designers could use numerous approaches to gather valuable cognitive empathic insights, e.g. using a medical wearable device (e.g. remote heart monitoring device) over a particular period would enable the design team to understand how the person wearing device feels in everyday situations.

Therefore, it is advisable to create the so-called "experience prototype" (Gasparini 2015). For example, driving to work, taking a bus or eating, are easy tasks that, for a person with special needs (e.g. handicap or disabled people), may be extremely hard to perform. Then, the design team may get insight into how difficult it is to perform these simple tasks and can gain empathy by understanding.

Therefore, we may conclude that the lack of empathy my cause severe problems into the next stages of design thinking.

To sum up, design thinking is a human-centric process, which aims to understand and even to predict the users' problems, challenges and needs. By knowing how to empathize, we can easily lay out the foundation of the next stages of design thinking process which you can explore into the next units.

References for Unit 1:
1. Ambrose G, Harris P (2010), *Design Th nking*, Copyright © AVA Publishing SA 2010 Gasparini A (2015), *Perspective and Use of Empathy in Design Thinking*, ACHI 2015: The Eighth International Conference on Advances in Computer-Human Interactions.
2. Meriam-Webster. n.d. Retrieved from https://www.merriam-webster.com/dictionary/empathy The Psychology of Emotional and Cognitive Empathy. n.d. Retrieved from: https://lesley.edu/article/the-psychology-of-emotional-and-cognitive-empathy

Unit 2. Define & Research

Tags:

Empathize; define; point-of-view; research; qualitative; quantitative; problem statement; primary research; secondary research;

Unit 2 - Introduction

This unit explores the transition from Empathize to Define mode. It enables the learners to understand better the matter of the "Define" stage as being a fundamental phase in the process. Design thinkers must be very precise whenever they have to clarify the exact user needs and to place their focus on a certain problem. In order to achieve excellence, it is highly recommended to visualize the collected information on a wall. Students will get familiar with the "point of view" approach, and how to use The Five Whys technique – a powerful, question-based strategy that help the design thinkers to consider the problem and drill it down to its root cause. In addition, some real-world examples will be given. Finally, the main types of research – primary and secondary – will be discussed, in order to help students find useful information which will give them benefits into the next stage of the workflow.

The Transition: Empathize to Define mode

When you move from empathy stage to drawing certain conclusions from that work, you need to process all the things you gathered in order to understand the matter of the challenge. Thus, you need to choose the right methodology that would enable you to find the root of the problem. Unpacking is a chance to start that process – sharing what you found with fellow designers and capturing the important parts in a visual form. It is highly recommended to visualize the information you have collected onto a wall where you can start to make connections - maps of journeys or experiences—anything that captures impressions and information about your clients.

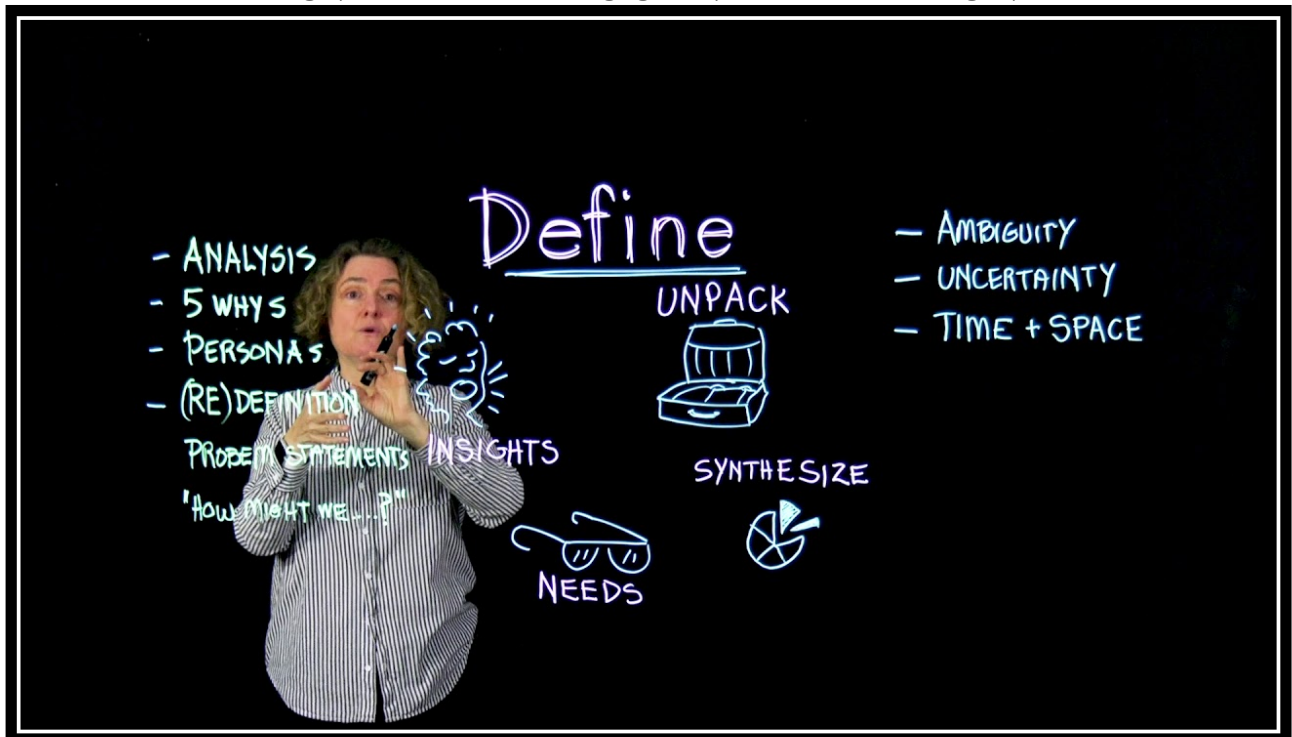The Define mode of the design process is all about bringing clarity and focus to the design space.

Image 1: Define mode, Source: https://www.youtube.com/watch?v=TNAdanuvwtc

The goal of the Define mode is to craft a meaningful and actionable problem statement – this is what we call a **point-of-view**. This should be a guiding statement that focuses on insights and needs of a particular user. Your further activities should be related with synthesizing information to discover connections and patterns. (*An introduction to design thinking process guide*, Stanford's d.school)

The Five Whys

Another question-based strategy, the "Five Whys" technique can help you get a real understanding of the problem and drill down to the root cause. Once you've identified the root cause, you have something that you can act upon - somewhere specific to focus your problem-solving efforts *(How To Define A Problem Statement: Your Guide To The Second Step In The Design Thinking Process, 14.01.2019)*.

Image 2: The Five Whys Source: https://www.youtube.com/watch?v=t7FcK8jV2yA,
https://www.youtube.com/watch?v=zbLxs6te5to

Let's take an example of a young working professional who wants to have healthy lifestyle which means to do sport on a daily basis, but finds it difficult to do so. Here's how you might use the "Five Whys" to break the problem down and get to the root cause:

1) Why s/he has not been started doing some sports on a daily basis? – S/he wants to do sport but does not know how to start.
2) Why s/he is feeling reluctant to be involved in sport activities? – S/he has a lack of sporting culture.
3) Why his/her sporting culture is poor? → S/he has never been practicing sport since s/he was a pupil.
4) Why hasn't s/he been practicing sport? → S/he doesn't have time to do sport.
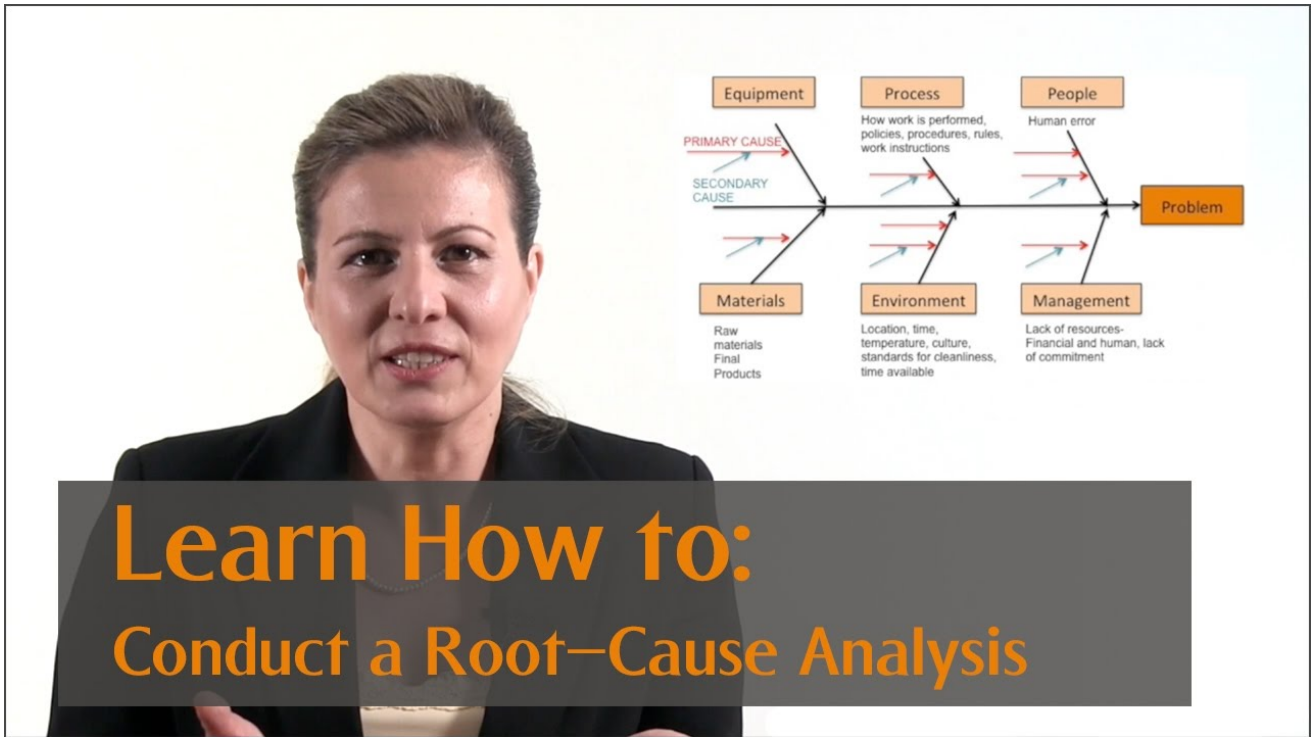5) Why doesn't s/he have time? → S/he works long hours and is exhausted.

Image 3: The root cause: lack of time Image 4: Source: https://www.youtube.com/watch?app=desktop&v=fK9IMuND1kg

The root cause here is a **lack of time**, so your solution might focus on efficiency and convenience, e.g. to include some sport activities in the office during his/her break or after finishing work. Your final problem statement might look something like this: "Youngworking professionals need a quick, convenient solution to do sport".

The Define mode could be applied not only for defining complicated challenges, but also in some daily activities when you are trying to solve some social problems. The "Innovate or Die Pedal Machine Contest" is a good example (Brown 2009). Google teamed up with the bike company Specialized to create a design competition whose modest challenge was to use bicycle technology to change the world. In a few weeks of brainstorming and prototyping, the team was able to define a present issue (1.1 million people in developing countries do not have access to clean drinking water), explore a variety of alternative solutions and build a working prototype: The Aquaduct – a human powered tricycle designed to filter drinking water while transporting it, is now traveling the world to help promote clean water innovation. It succeeded because of the inflexible constraints of technology (pedal power with a budget of 0.00 EUR and inflexible deadline).

Image 4: https://www.taproot.com/healthcare-root-cause-analysis/

However, on in Module Branding, Unit 1: The Brief, we will discuss in details the exact brief format and its related features.

Research

Once the brief has been defined and agreed, you can start searching for information that can be useful into the creative process at the next ideate stage. It is a common belief that research can be either quantitative or qualitative. The quantitative is featured by using numbers to record information, for example pressures, bending forces, population densities, cost indices etc, or qualitative, with information about what that user group buys or consumes and what their lifestyle is like. Qualitative data cannot be accurately measured and counted, and are generally expressed in words rather than numbers. Essentially human activities and attributes such as ideas, customs, mores, beliefs.
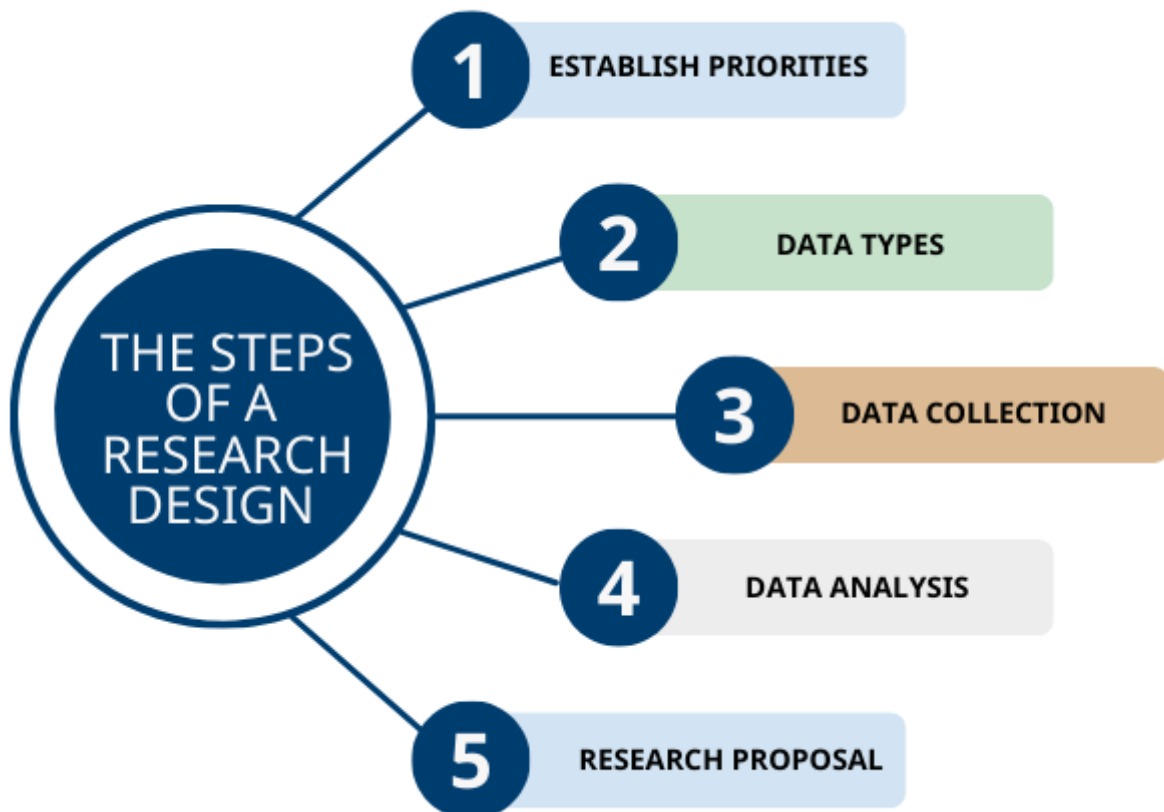

Image 5, Sourse : https://www.researchprospect.com/how-to-write-a-research-design/

This includes factors such as education, career, holiday destinations, musical tastes, aspirations and so on. (Ambrose & Harris, 2010). However, we can distinguish two types of collecting data:

A primary source of research is the feedback generated during the learning phase of projects previously undertaken with the same or similar clients. Such feedback provides a starting point with regard to what worked and what did not work with a specific target group.

Secondary research is the information obtained from general secondary sources such as consumer market research reports. These provide the demographic breakdown and historic performance of given markets and market segments, and provide a clear view of how a market is structured.

10

Recommendations for Further Reading

However, we recommend taking Module Branding, Unit 1: The Brief, where you will get acquainted in details with the brief format and its related features and specifics.

References for Unit 2:

1. Ambrose G, Harris P (2010), *Design Th nking*, Copyright © AVA Publishing SA 2010 Brown T, (2009) *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation,* ISBN-10: 9780061766084, Publisher: HarperBusiness, pp.22
2. An introduction to design thinking process guide, Stanford's d.school (n.d.). Hasso Plattner. Institute of Design at Stanford(https://dschoolold.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/Mod eGuid eBOOTCAMP2010L.pdf).
3. How To Define A Problem Statement: Your Guide To The Second Step In The Design Thinking Process, Emily Stevens, 14.01.2019, https://careerfoundry.com/en/blog/ux-   design/stage-two-design-thinking-define-the-problem/.
4. Jeanne Liedtka, Why Design Thinking is Important, Harvard Business Review,
https://hbr.org/2018/09/why-design-thinking-works
5. Dave Grey, https://amplifyingcognition.com/dave-gray-visual-thinking-gamestorming-art-possible-going-towards-fear-ac-ep17/

Unit 3. Ideate

Tags:
Ideate; design; brainstorming; braindumping; mindmapping; movement; sketching; outside of the box' inside of the box;

Unit 3 - Introduction

This unit will shed some light on ideation – a process which transition happens from identifying problems to creating effective solutions. You will get familiar with some of the most popular methods of ideation, such as brainstorming, brain dumping, mind mapping, sketching and movement. Furthermore, you will be introduced to some valuable tips and tricks that will help you to unleash your creative genius and come up with quick and effective solutions. This unit will help you to understand the process of ideation as well as the development of products/services under constraints. In addition, you will gain an understanding of such popular design thinking statements as "Thinking Outside of The Box" and "Thinking Inside of The Box". Through examples, you will get to the core of the concept and practise of ideation, an important stage of the design thinking process.

Design in its matter is focused on the creation, development, and implementation of ideas that meet certain needs. (Shanna et al 2016). The stage where design thinkers consider multiple alternatives is called: Ideation. You ideate in order to move from identifying problems to creating effective solutions for your users.
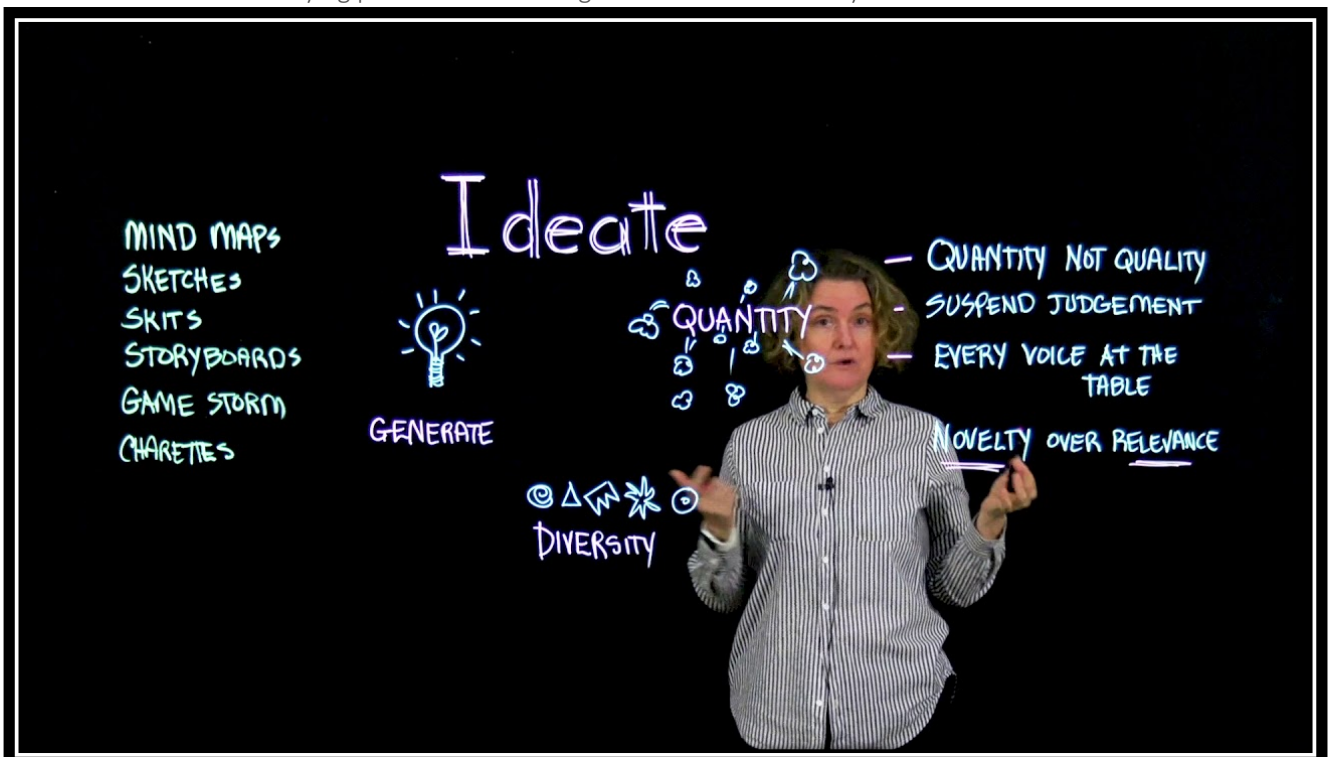

Image 1: Ideation – A transition from identifying problems to creating effective solutions.
Source: https://www.youtube.com/watch?v=zbLxs6te5to

Ideation is your chance to blend the understanding you have of the problem space and people you are designing for with your imagination to generate solution concepts It is one of the most important phase in the process where design thinkers of all level of expertise may struggle in achieving quantity and diversity of creative solutions. Therefore, it is crucial to choose the right technique in order to unleash your creativity. One of the most widely popular technique from this phase is brainstorming, which is about generating numerous ideas based on your experience. Brainstorming is a design thinking method, and it has its own specifics. It is highly recommendable to allow everyone in the group to have creative freedom.

Image 2: Brainstorming session

During lunch or a period of about an hour, hold a brainstorm that focuses on a few of the needs that you uncovered during the previous stage. Include your staff in the brainstorm, and make sure everyone is feeling comfortable and energized before starting the process (Design Thinking In a Day, 2018).

Image 3: Osborn's four rules, source:https://analytixminds.com/techniques-of-brainstorming-with-examples/

You can apply the following practices in order to boost the effectiveness of your brainstorming session:
1. Avoid judgement - there are no poor ideas at this point. There will be plenty of time to narrow them down later.
2. Encourage weird ideas - even if an idea does not seem realistic or a bit weird, it may spark a great idea for someone else.
3. Contribute to ideas of others - use "and" rather than "but."
4. Stay focused on the topic - to get more out of your session, keep your brainstorm question in sight.
5. Spark a conversation. All ideas need to be heard, so that they may be built upon.
6. Visualize - sketch your ideas, as opposed to just writing them down. Stick figures and simple drawings can

say more than many words.

7. Generate multiple ideas - the best way to find one good idea is to come up with lots of ideas. For example, come up with 20 to 30 ideas in 10 minutes.
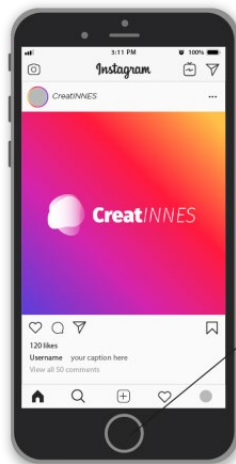
There are other ideation techniques such as:

- **Brain dumping** – like brainstorming but done individually.
- **Mind mapping** – distinguishing the possible solutions based on their importance and connecting them to its related problems.
- **Movement** – using the widely popular question "what if?" – overcoming certain challenges and finding appropriate solutions.
- **Sketching** – developing rough sketches in order to illustrate possible solution.

Image 4 : https://www.1000ventures.com/business_guide/crosscuttings/creativity_brainstorming.html

Constraints

Image 5: Constraints
Source: https://www.freepik.com/free-photos-vectors/frame">Frame vector created by freepik - www.freepik.com

There are many evidences that setting some constraints could significantly boost the quality of your solution. For example, iPhone was developed with one constraint: one button. The 140-symbols is another constraint which is the core of the Twitter. Nestlé challenged its packaging designers to use less plastic in its water bottles. Designers quickly realized that merely reducing the plastic meant a flimsy bottle. The constraint led them to study the human body. They slimmed the waistline of the bottle and added ribbing to the base. The result was a bottle that could stand alone while using less plastic and was cheaper to produce.

14

Think Outside of The Box vs Think Inside of The Box

Image 6: https://killerinnovations.com/box-
think/#:~:text=Most%20people%20tend%20to%20think,atmosphere%2C%20but%20not%20the%20team.

Think Outside of The Box it is a widely popular statement used by many professionals without being completely familiar with it. Arguably, it refers with finding alternative solutions by embracing more innovative challenge – conceptualizing the problems and approaching the problems in new innovative ways. For example, Lever (a US-based software company) aims to build upon technology that's already been rolled out by holding quarterly planning sessions. What may sound like stuffy is actually a highly-anticipated event that allows internal staff to see the effects of past projects and to pitch new ideas. The goal is to use these ideas to design differentiating features.

On the other hand, copying existing components such as "picture in picture" in the TVs is a great example of utilising thinking inside of the box.

Another example for applying those method is LCM Scrap Ltd noticed a strange anomaly: One of its manufacturing plants had a significantly lower scrap rate. A lower scrap rate implies a more-efficient manufacturing process. But what was the plant doing differently? Corporate managers went out to investigate. They found that an engineer at the division, which did injection molding, had developed a way of preprocessing the plastic pellets so that when they were fed into the system, they flowed more smoothly. The machines didn't have to be cleaned as frequently, and there was less scrap (When You Are Innovating, Think Inside the Box, 2018).

However, one feature that characterize all of them is to postpone the judgment as much as you can. Starting with evaluating other ideas into the very beginning could have a negative impact upon the generation of ideas. Think inside and outside of the box by giving your imagination and creativity a voice, while focusing on your rational side could significantly decrease the quality and the effectiveness of the outcome.

References for Unit 3:

1. Daly, Shanna & Seifert, Colleen & McKilligan, Seda & Gonzalez, Richard. (2016). Comparing Ideation Techniques for Beginning Designers. Journal of Mechanical Design. 138. 10.1115/1.4034087.
2. Design Thinking In a Day (2018), IDEO, Retrieved from: http://designthinkingforlibraries.com
3. When You Are Innovating, Think Inside the Box, 10.12.2018, Sayed Ifran, Retrieved from: https://www.smestrategy.net/blog/when-you-are-innovating-think-inside-the-box
4. Design thinking for Better UX, Laura Angelica23.03.2023, https://mockitt.wondershare.com/ui-ux-design/design-thinking.html
5. Box Think - Combining Inside and Out of The Box Thinking, PhilMcKinney, https://www.youtube.com/watch?v=RTxcLIAwv2U

Unit 4. Prototyping

Tags:

Prototype, fidelity vs. functionality, MVP, Looks-like-works-like prototype, Wizard of Oz prototypes

Unit 4 - Introduction

In the final unit of this module we will be discussing the fourth stage of the design thinking process: prototyping, i.e., the construction of a basic version of your proposed solution which enables you to demonstrate your idea in some tangible way, rather than just talk about it in the abstract. Although a prototype may mean quite different things in the case of different projects and different people, design thinkers rarely pass up the opportunity to use some sort of a prototype to be able to *show* the end result of a specific design thinking process for creating memorable product experiences, and to be able to subject that end result to a proper feasibility, reality, and viability check. In this unit, you will learn about the rationale behind prototyping, the different categories and forms of prototypes, as well as a little about tools and methods used for prototyping.

If you want to get the most out of empathy in the design thinking process (to refer back to the first unit of this module), and you want to maximize the surface area where you can get insights from the people whose problems you are solving – i.e., for whom you are designing – it will be necessary to avail yourself of a prototype, where availing yourself of a prototype in most cases means building one. The prototype will prolong, deepen, and sharpen the conversation that you can carry with your (potential) users, allowing you to more specifically and more solidly explore their needs. In short, a prototype can start to bring to life the *experience* that your users will have with your product or service. As Dave Gray put it, your prototype allows "your design, product, or service to practise being itself" (cited by Todd Zaki Warfel at https://www.slideshare.net/toddwarfel/ux-aus-prototyping/4- Prototyping_is_practice_for_people, page 4).

Image 1: https://www.youtube.com/watch?v=zbLxs6te5to

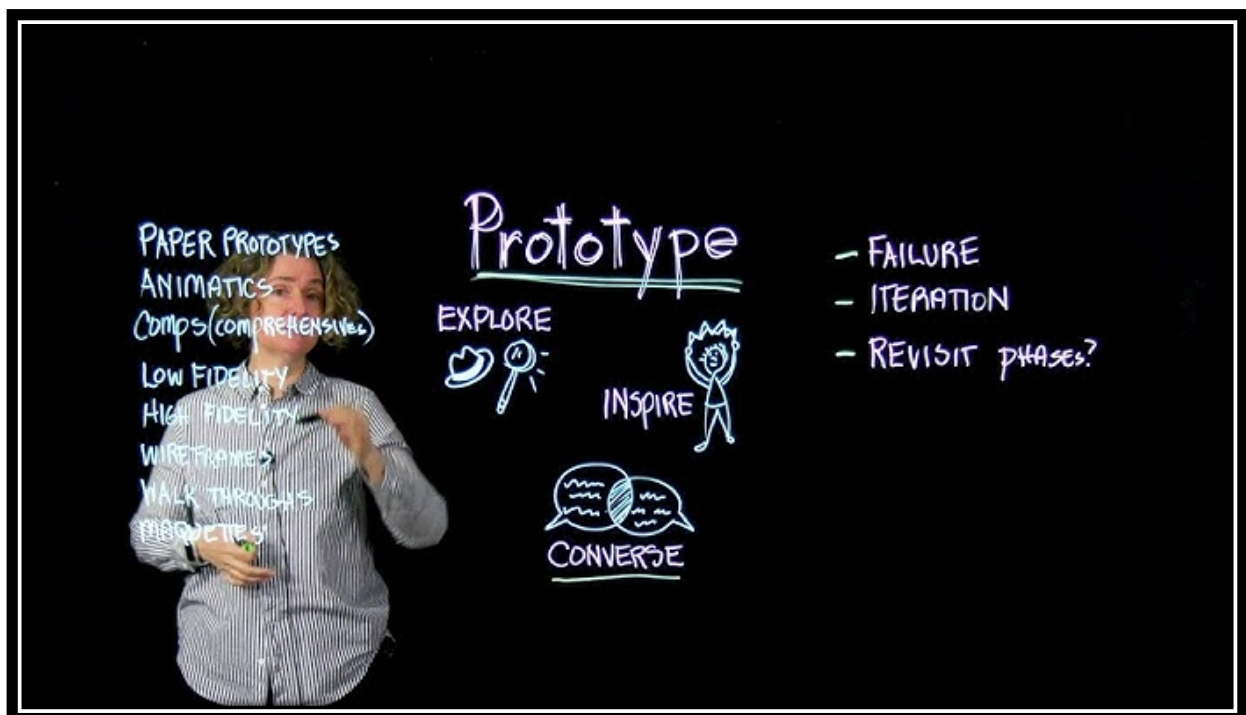## Reasons for taking prototyping seriously

There are various benefits one can derive from having a fit-for-purpose prototype. Here are a few of the most salient ones (see UXPin 2015 pp 9-21):

- It is easier to **communicate** your idea, design concept, or product if you have a way to give a visual – and tactile – sense to your audience of what you are talking to them about. Prototypes are less likely to be misinterpreted than verbal descriptions.
- You can **collaborate** on the iteration of the product with your collaborators more easily if there is something tangible to work together on.

- **Experimentation**, feasibility checking, and risk taking in the development process all become cheaper when done on a prototype.
- You can also **sell** your idea more efficiently, and you can **test usability** and fix bugs/faults earlier with a prototype.
- Finally, you can better **adjust your design priorities to reality** if you immediately apply them to an existing prototype, so that you are not carried away by your own potentially ungrounded ideas and unshackled creativity. In other words, prototypes help decision-making during the design process because they facilitate validated design choices early on concerning usability, ergonomics, shape, function, production, etc. As it is sometimes said, prototyping merges creativity andfeasibility.

For all these reasons, and some more, it almost always makes sense to build a prototype already in the early phase of your product development process.

Categories of prototypes

When it comes to prototyping, the two most basic variables to consider are visual fidelity and level of functionality, and since there is often a trade-off between them (whenever time and/or budget concerns are an issue), the combination or relative priority of the two. There is of course no universally shared consensus regarding the right values that these two variables should take, as there is a wide range of contexts, budgets, timeframes, approaches, methods, and styles in relation to prototyping.
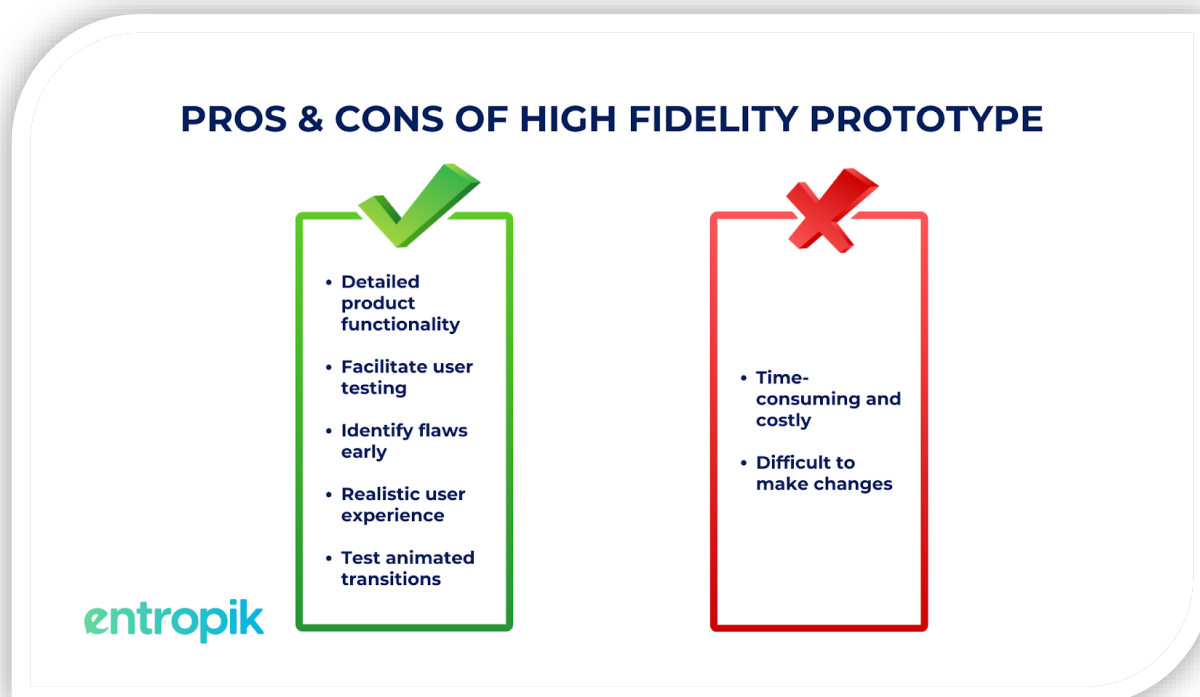

Image 2: Fidelity vs. Functionality
https://www.entropik.io/blogs/choosing-the-right-ux-prototype-low-fidelity-vs-high-fidelity

Taking a closer look, prototypes can be described along four dimensions (UXP in 2015: pp 31-36): 1. **Physical form** (paper, software, metal, plastic, etc.), 2. **Fidelity** (level of detail and realism, as in low-fi vs- hi-fi), 3. **Interactivity** (starting with "watch only," all the way to complete interactivity), and 4. **Expected lifecycle** (at one extreme, quickly built and then thrown away, at the other extreme, meant to be the carrier of further iterations until turning into the final product).

In the case of **software** design and development, five steps have traditionally been distinguished (see UXPin 2015: pp 23-31), which can be associated with different parts on the fidelity-functionality graph of Image 6 above:

1. **Sketching** (quick and rough drawings on paper),
2. **Wireframing** (skeletal frameworks with boxes and rough shapes),
3. **Mockups** (wireframes enriched with visual design elements, such as colors, typographies, photos, etc.),

4. Prototyping (mockups raised to the next level by stitching screens together or even adding animations/ interactions), and

5. Development (creating the final product properly coded). In this sequence, prototyping in the narrow sense is differentiated from the more preliminary stages of the design process, but in reality, this sequential logic is rarely followed rigorously. With various "rapid prototyping" and "get-into-coding-as-quickly-as-possible" approaches carrying the day, it is more common to merge these archetypical steps, and leap-frog some of them in the interest of making the development process lean and agile.

One concept that has gained a lot of currency in recent years is that of the **Minimum Viable Product** (MVP), popularized by the *Lean Startup* approach (see Ries 2011). While an MVP is in some ways similar to a prototype, as both are tools for early viability checks and product idea validation, they are also different in important ways. While a prototype is meant to show how a product will look, feel, and function in the hands of the end users (even when only in some limited way), an MVP is a narrowly targeted testing tool that is meant to test one (or at least very few) specific assumption(s) regarding the envisioned product, and is therefore devoid of all features that are not directly relevant to whatever is being tested. The goal of the MVP approach is to prevent the waste of time and money on building products, or even prototypes, that may prove to be dead ends. This said, an MVP may in some cases be in fact a proper prototype (when the situation requires that), but in other cases it may be a single landing page (without anything behind it) or some other realistic "façade" of a yet-to- be-built product, a "concierge" service disguised as a functioning product, or some cheap hack that works as a makeshift tool to test a single hypothesis in relation to an imagined product. Such MVPs are sometimes referred to as "Wizard of Oz" prototypes.

Hardware prototyping

In the case of **hardware** products, the traditional sub-categories will predictably be different from those in the case of software products. While there are fewer pre-prototype categories (**Proof-of-Concept**, PoC, being the main such category), there are various sub-categories of prototypes (see Teel 2019), such as **Works-like prototypes** (the main difference from PoCs being that the technological core – typically the internal electronics – is custom-made, and not just an assembly of off-the-shelf components, as is usually the case with PoCs), **Engineering prototypes** (or "works-like-looks-like prototypes", where appearance and functionality come together), and **Pre-production prototypes** (works-like-looks-like prototypes that have been optimized for manufacturing).

Image 3: Hardware prototyping kits, https://www.youtube.com/watch?v=afDqeUKVg8Q

Prototyping methods and tools

There is no room here for more than a cursory look at the wealth of prototyping methodsand tools that are available for software and hardware prototyping today. Beyond traditional tools such as good old **paper prototyping** and **"Wizard of Oz" prototyping** (see above at the discussion of MVPs), there are various digital prototyping tools apt for

different contexts and purposes, including **presentation software** (such as PowerPoint, Keynote, and Prezi.com), **graphics editors** (such as Photoshop or Sketch, see UXPin 2015: pp 99-131), **coded prototypes** (avoiding the "I design it, you build it" waterfall mentality – see UXPin 2015: p 52, citing Andy Fitzgerald of Deloitte Digital), and using **dedicated prototyping software** and apps (such as UXPin, Invision, MockFlow, JustInMind, Axure, Omnigraffle, JustProto, Flinto, or Marvel – see UXPin 2015: p 56). For hardware prototyping, there is also a wide range of tools, from microcontrollers (such as Arduino) and prototyping circuit boards (such as Raspberry Pi), to various prototype manufacturing processes, such as 3D printing, CNC machining, sheet metal processes, and different plastic and metal casting methods (see Outdesign 2018).

References for Unit 4:
1. Outdesign (2018): *A Guide to Prototyping for Hardware Startups*. Blogpost retrieved from https://www.outdesign.co/single-post/A-Guide-to-Prototyping-for-Hardware-Startups.
2. Eric Ries (2011): *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Publisher: Crown Business.
3. John Teel (2019): *Overview of the Various Types of Hardware Prototypes*. Retrieved from https://predictabledesigns.com/overview-of-the-various-types-of-hardware-prototypes/.
4. UXPin (2015): *The Ultimate Guide to Prototyping. The Best Prototyping Methods, Tools, and Processes* (https://www.uxpin.com/studio/ebooks/guide-to-prototyping/).
5. Todd Zaki Warfel (2010) *Practrical Prototyping*. Slideshow retrieved from https://www.slideshare.net/toddwarfel/ux-aus-prototyping/4-Prototyping_is_practice_for_people.
6. The Dance Between Fidelity and Confidence in Digital Product Development by Pondd Sugthana, published in Bootcamp in May 28, 2023, https://bootcamp.uxdesign.cc/the-dance-between-fidelity-and-confidence-in-digital-product-development-f6808c1f95af
7. Mindful Marks, https://www.youtube.com/watch?v=bpVzgW8TUQ0