



ANNEX II

DESIGN TOOL COLLECTION

- Introduction

The process

Set up tools and techniques

Explore tools and techniques

Generative tools and techniques

Future Implementation

A collection for your creative work

The action of collecting is somewhat of a basic human activity. It is a practice that has always been part of different design disciplines to document, inspire and create a new value of the single items when assembled in a group. No two collections are exactly the same, as each one is put together with unique perspectives. Achille Castiglioni, a master of the Italian design was a proud collector of small little objects and he used to say “one day will come in handy”.

This particular collection is a selection of tools and techniques created by some of the most recognized design firms and institutions around the world, that are already sharing their knowledge as open source material, including IDEO, Delf University, IDEActivity, Waag Society, Stanford University and MJV. The collection is not meant to be a comprehensive encyclopedia of all the existing tools out there, instead should be taken as a complementary reference with general characteristics that are adaptable to any creative process. They are organized depending on the phase in which they can be used, starting from understanding The **Process**, **Set up** your work, **Explore**, **Generate** and **Implement** your ideas.

The collection inspired the creation of [our DIDIY Toolkit](#), a specific toolkit dedicated to projects, challenges and activities related to the digital do it yourself scenario.

Introduction

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Lenses of human-centered design

Human Centered Design toolkit-IDEO

The learning process in DIDIY is a shared practice among the educational community. Co-design is based on the Human-Centred Design approach. Take a look at this introduction to familiarize with the process.

6 H C D

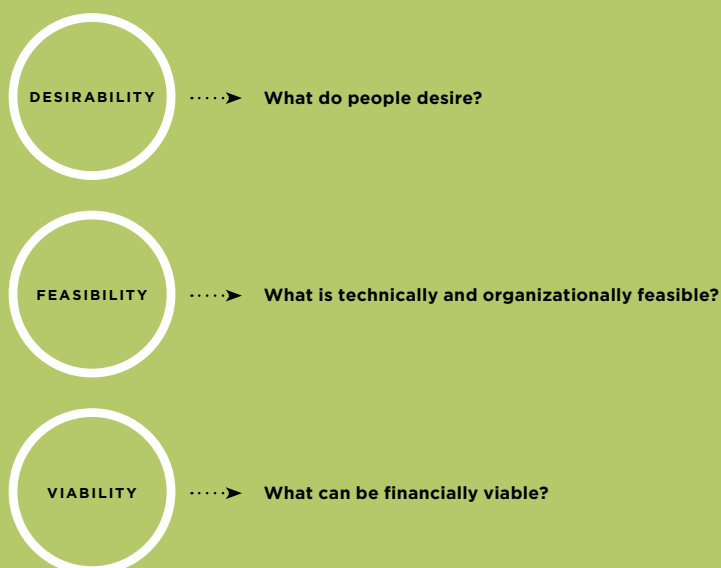
Introduction
The Three Lenses of
Human Centered Design

THE THREE LENSES OF HUMAN-CENTERED DESIGN

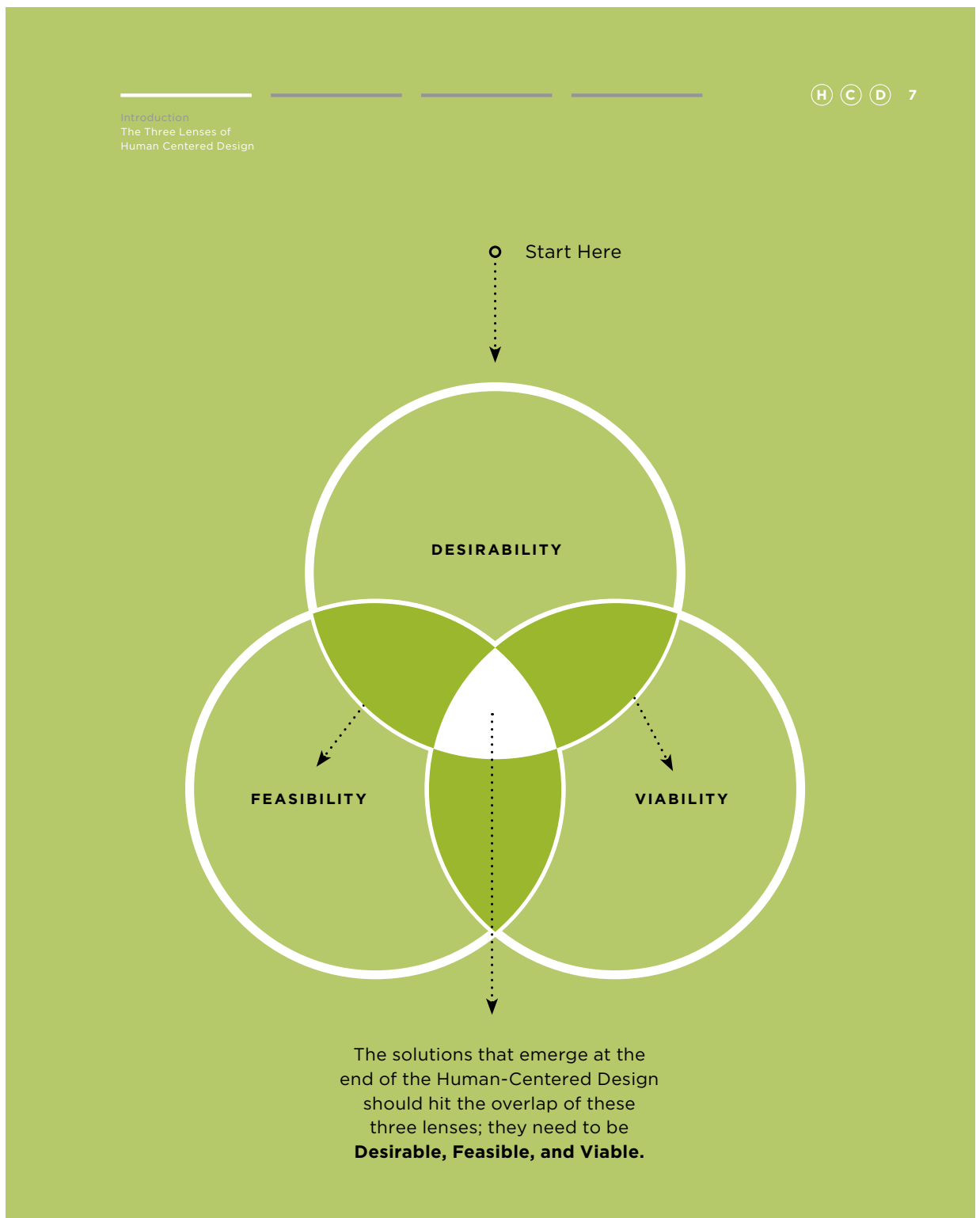
Human-Centered Design (HCD) is a process and a set of techniques used to create new solutions for the world. Solutions include products, services, environments, organizations, and modes of interaction.

The reason this process is called “human-centered” is because it starts with the people we are designing for. The HCD process begins by examining the needs, dreams, and behaviors of the people we want to affect with our solutions. We seek to listen to and understand what they want. We call this the Desirability lens. We view the world through this lens throughout the design process.

Once we have identified a range of what is Desirable, we begin to view our solutions through the lenses of Feasibility and Viability. We carefully bring in these lenses during the later phases of the process.



This process begins by examining the needs, dreams, and behaviour of people. Keep in mind all these three lenses when starting up with your solutions.



Design process

Design Kit - IDEO.org

To Understand the phases of the process. Any kind of design process has different main phases, we find the Immersion, Ideation, and Prototyping to be one of the easiest to begin with and to understand.

Introduction

Understand the Process

Human-centered design isn't a perfectly linear process, and each project invariably has its own contours and character. But no matter what kind of design challenge you've got, you'll move through three main phases: Inspiration, Ideation, and Implementation. By taking these three phases in turn, you'll build deep empathy with the communities and individuals you're designing for; you'll figure out how to turn what you've learned

into a chance to design a new solution; and you'll build and test your ideas before finally putting them out into the world. At IDEO.org and IDEO, we've used human-centered design to tackle a vast array of design challenges, and though our projects have ranged from social enterprises to communication campaigns to medical devices, this particular approach to creative problem solving has seen us through each time.



INSPIRATION

In this phase, you'll learn how to better understand people. You'll observe their lives, hear their hopes and desires, and get smart on your challenge.



IDEATION

Here you'll make sense of everything that you've heard, generate tons of ideas, identify opportunities for design, and test and refine your solutions.



IMPLEMENTATION

Now is your chance to bring your solution to life. You'll figure out how to get your idea to market and how to maximize its impact in the world.

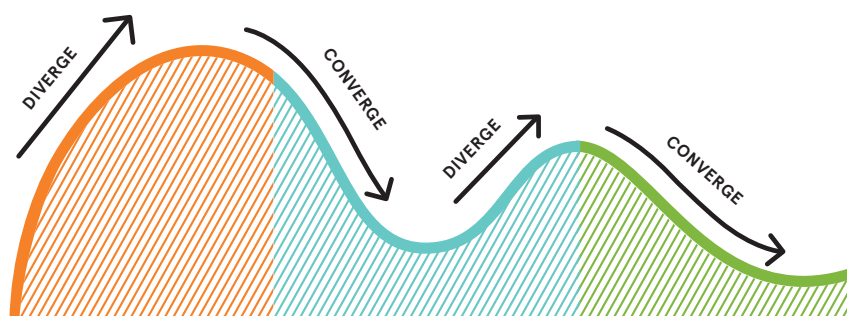
Changing perspective and accepting the unknown is often the key to innovation. Take a read at how embracing ambiguity is part of the process, too.

Introduction

Trust the Process Even if It Feels Uncomfortable

Human-centered design is a unique approach to problem solving, one that can occasionally feel more like madness than method—but you rarely get to new and innovative solutions if you always know precisely where you're going. The process is designed to get you to learn directly from people, open yourself up to a breadth of creative possibilities, and then zero in on what's most desirable, feasible, and viable for the people you're designing for. You'll find yourself frequently shifting gears through the process, and as you work through its three phases you'll swiftly move

from concrete observations to highly abstract thinking, and then right back again into the nuts and bolts of your prototype. We call it diverging and converging. By going really big and broad during the Ideation phase, we dream up all kinds of possible solutions. But because the goal is to have a big impact in the world, we have to then identify what, among that constellation of ideas, has the best shot at really working. You'll diverge and converge a few times, and with each new cycle you'll come closer and closer to a market-ready solution.



Human-Centered Design Process

Human Centered Design toolkit-IDEO

Another way to look at the Human-Centered Design process is through your senses and actions: Hear, Create and Deliver.

8 H C D

Introduction
The HCD Process

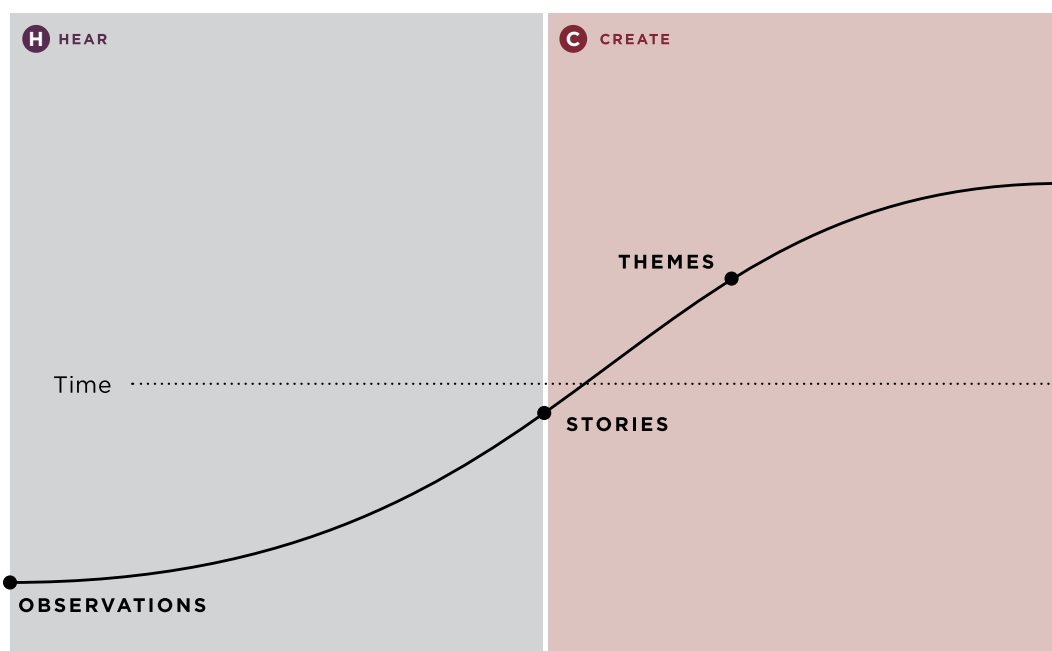
THE HCD PROCESS

The process of Human-Centered Design starts with a specific Design Challenge and goes through three main phases: Hear, Create, and Deliver. The process will move your team from concrete observations about people, to abstract thinking as you uncover insights and themes, then back to the concrete with tangible solutions.



HEAR

During the Hear phase, your Design Team will collect stories and inspiration from people. You will prepare for and conduct field research.



Each step can give you a better overview and a general idea on how to plan a design path.

Introduction
The HCD Process

H C D 9



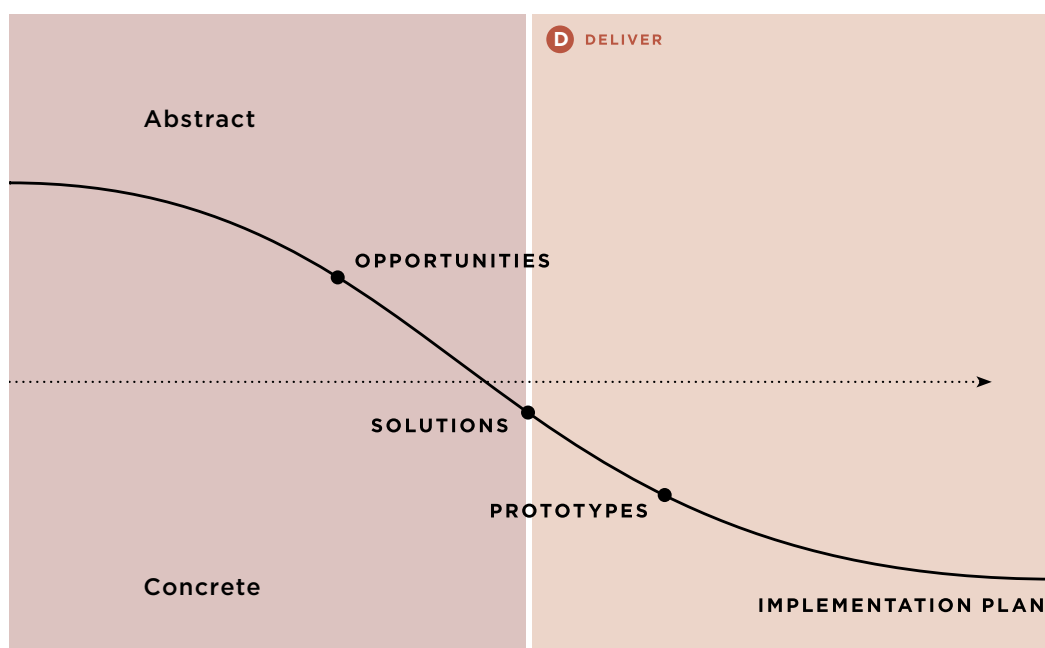
CREATE

In the Create phase, you will work together in a workshop format to translate what you heard from people into frameworks, opportunities, solutions, and prototypes. During this phase you will move together from concrete to more abstract thinking in identifying themes and opportunities, and then back to the concrete with solutions and prototypes.



DELIVER

The Deliver phase will begin to realize your solutions through rapid revenue and cost modeling, capability assessment, and implementation planning. This will help you launch new solutions into the world.

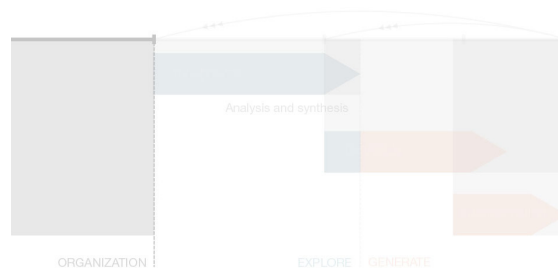


To recall these phases, simply remember H-C-D.

Creativity Techniques

The Delft Design Guide

The creative techniques and design tools are essential for thinking up solutions to problems. This guide by Delft University can help you demystify creativity and uncover the magic.



What Are Creativity Techniques?

The techniques for thinking up solutions to problems are called 'creativity techniques' or 'creativity methods'. Most of these methods are general - they are applicable to a wide variety of problems. Creativity techniques are very useful in the design process, generating large amounts of ideas in a short time. There are many different creativity techniques, often classified according to structures like the following one (see Marc Tassoul, 2007):

1 Inventorying techniques

Techniques used to collect and recall all kinds of information around an issue. This helps in making an inventory of what we have in terms of ideas, or data, or whatever. Examples are Mind Maps (see 'Mind Map' in this section).

2 Associative Techniques

With associative techniques, great numbers of ideas and options are generated through association within a relatively short time. Association techniques encourage spontaneous reactions to ideas expressed earlier. An example of an associative technique is the brainstorming method (see 'The Brainstorming Method' in this section).

3 Confrontational Techniques

With confrontational techniques, ideas are generated by thinking outside one's familiar frame of reference. By identifying and breaking assumptions you are able to open up a wider solution space. New connections are made between the original issues in hand and a new idea through bisociation or force-fit. Completely new, unexpected combinations of viewpoints can arise, which bring the solution of the problem one step closer. An example is the Syntectics method (see 'Syntectics' in this section).

4 Provocative Techniques

With provocative techniques, assumptions and preconceptions are identified and broken from inside the familiar frame of reference (e.g. by asking questions like: "What if not?" and "What else?"). Provocative techniques make use of analogies,

metaphors and random stimuli. Ideas will seem strange at first, but when force-fitted on the original issues they provoke new insights. Both confrontational and provocative techniques contain the principle of (1) making the strange familiar and (2) the familiar strange.

5 Intuitive Techniques

With intuitive techniques you develop a vision, or a new perspective on the original issue in hand. Intuitive techniques are useful for letting go: to guide the idea generation techniques by whatever comes to mind. It is a technique that allows for spontaneous and intuitive idea generation and reflecting upon the generated ideas. These techniques have a great influence on enthusiasm, motivation and courage of

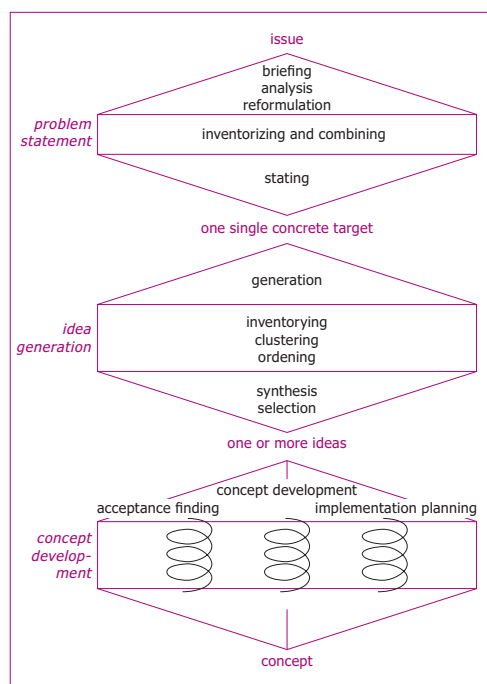


fig. 2.18 CPS model revisited of the Creative Problem Solving Process (Tassoul and Buijs, 2005)

The Delft Design Guide

There are many different creativity techniques, often classified according to their use in the phases of the process. Train them, test them and make them yours.

6 Analytic-Systematic Techniques

Analytic-systematic methods are based on the analysis and systematic description of a problem, the drawing up of an inventory of solutions, variants to subproblems, and the systematic varying and combining of these solution variants. The morphological method and function analysis are the most typical examples (see 'Function Analysis' and 'Morphological Chart' in this section).

Creative Problem Solving

In order to apply the various creativity techniques effectively, a creative process needs to be followed. A very simple model of the creative process is provided by Wallas (1926): (1) preparation, (2) incubation, (3) illumination, and (4) verification. In the preparation phase the problem is defined. During the incubation phase, the issue is let go and attention is focused on other (inspirational) aspects. In the illumination phase an opening is (suddenly) found, from which an approach is developed to deal with the issue in hand. During the verification phase the idea is tested and evaluated. Tassoul and Buijs (2005) have modelled the creative problem-solving process in a more elaborate model, called the CPS model revisited (see figure 2.18). This model consists of three phases: (1) problem statement, (2) idea generation, and (3) concept development.

fig. 2.19
Creative
Diamond Marc
Tassoul/Jan
Buijs (2005)

When Can You Use Creativity Techniques?

Creativity techniques are mostly used in a creative workshop, or in a brainstorm setting typically taking place at the beginning of the conceptual design phase, starting the phase of creating product ideas and concepts.

How to Use Creativity Techniques?

Starting Point

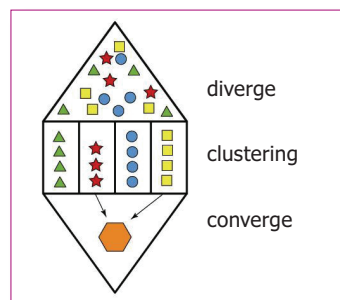
Expected Outcome

Possible Procedure

Tips and Concerns

References and Further Reading

- Tassoul, M. (2006) *Creative Facilitation: a Delft Approach*, Delft: VSSD.
- Roozenburg, N.F.M. and Eekels, J. (1995) *Product Design: Fundamentals and Methods*, Utrecht: Lemma.
- Roozenburg, N. and Eekels, J. (1998, 2nd ed.) *Product Ontwerpen: Structuur en Methoden*, Utrecht: Lemma.
- Wallas, G. (1926, 1970) 'The art of thought', In: Vernon, P.E. (ed.) *Creativity*, Harmondsworth: Penguin.



Introduction

The process

- Set up tools and techniques

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Future Implementation

Set up

IDEActivity Toolkit

Set Up is the pragmatic aspect of the building the session. Before a creative session is conducted, you need to consider few aspects such as the goal, the team and the location. These cards will help you with the set up of your activities.



SET UP

Before you begin...

Before a creative session is conducted, it should be thought out and structured, considering the goal to be achieved, the available team and the location in which the sessions will be carried out: the techniques to be employed should be selected accordingly.

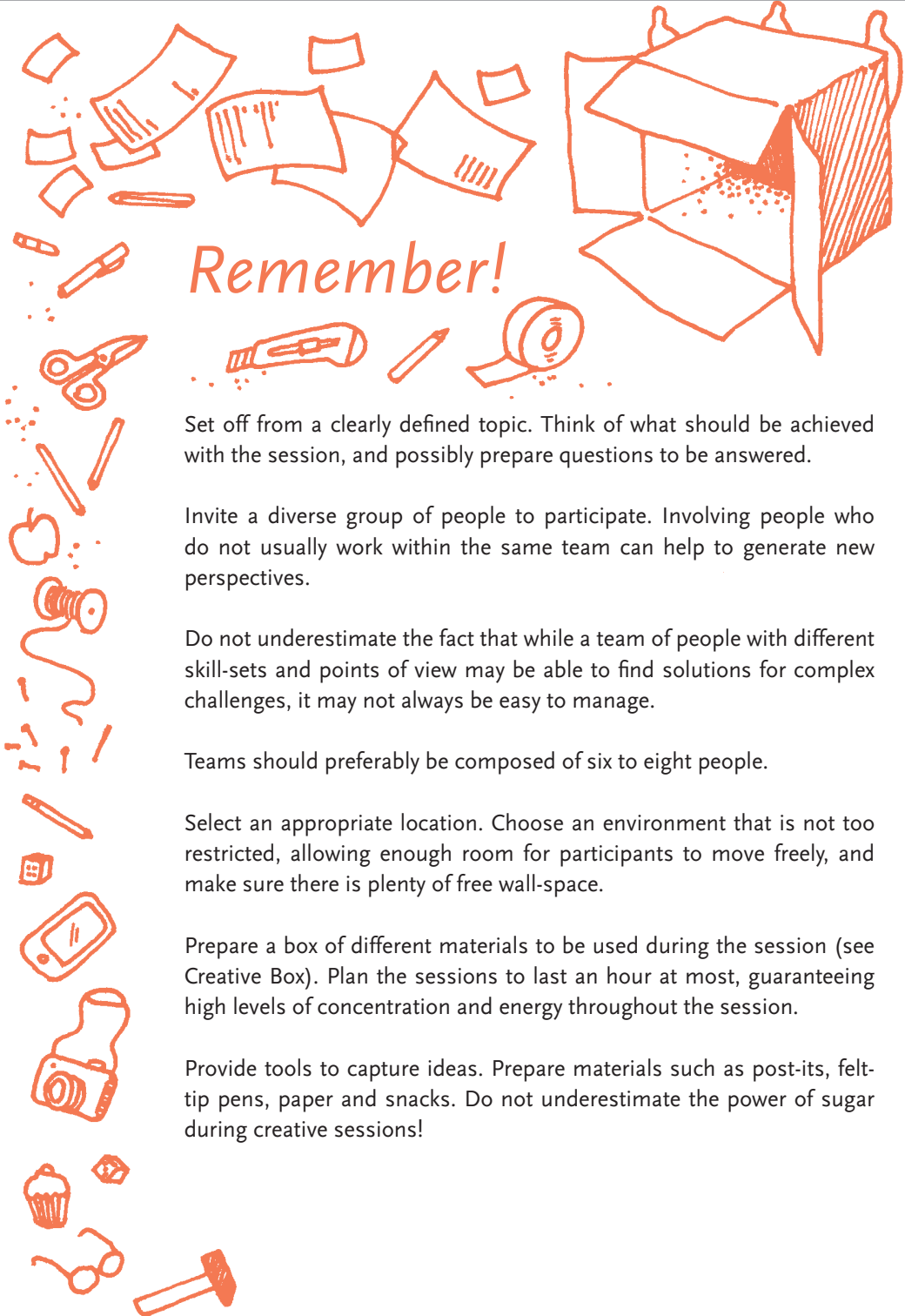
The session may be planned by an individual facilitator or by the team. In the latter case, it is important that the team's members be selected for their advanced and differentiated skills, and ability to work in groups within multi-disciplinary settings.

Tools:

- *Creative Session Plan (CSPlan)*
- *Elicitation Card*
- *Creative Box*

IDEActivity Toolkit

You can also use them as a checklist to make sure you don't forget to cover some important aspects and get yourself prepared.



Remember!

- Set off from a clearly defined topic. Think of what should be achieved with the session, and possibly prepare questions to be answered.
- Invite a diverse group of people to participate. Involving people who do not usually work within the same team can help to generate new perspectives.
- Do not underestimate the fact that while a team of people with different skill-sets and points of view may be able to find solutions for complex challenges, it may not always be easy to manage.
- Teams should preferably be composed of six to eight people.
- Select an appropriate location. Choose an environment that is not too restricted, allowing enough room for participants to move freely, and make sure there is plenty of free wall-space.
- Prepare a box of different materials to be used during the session (see Creative Box). Plan the sessions to last an hour at most, guaranteeing high levels of concentration and energy throughout the session.
- Provide tools to capture ideas. Prepare materials such as post-its, felt-tip pens, paper and snacks. Do not underestimate the power of sugar during creative sessions!

Session

Organization

Human Centered Design toolkit-IDEO

This framework from IDEO is also a very good resource to help you structure your creative session.

Introduction
Best Practices
for Innovation

H C D 13

MULTI-DISCIPLINARY TEAMS

The challenges you face are very complex and are likely to have been explored by predecessors. You will have a higher likelihood of success at solving such complex, difficult, and already-examined problems by intentionally assembling the right team of people. This team will work best if it consists of a core group of 3-8 individuals, one of whom is the facilitator. By mixing different disciplinary and educational backgrounds, you will have a better chance of coming up with unexpected solutions when these people approach problems from different points of view.

DEDICATED SPACES

Having a separate project space allows the team to be constantly inspired by imagery from the field, immersed in their post-it notes, and able to track the progress of the project. If possible, find a dedicated space for your design team to focus on the challenge.

FINITE TIMEFRAMES

Many people notice that they work best with deadlines and concrete timelines. Likewise, an innovation project with a beginning, middle, and end is more likely to keep the team motivated and focused on moving forward.



TIP

To ensure that there is a balanced gender perspective, involve female staff in all phases of this process.

Communication

Participants

Teacher Maker Camp - Waag Society

When in a creative session or workshop pay attention to the way you communicate your intentions, your vision and find a way to get everyone feel engaged with your plan.

PARTICIPANTS

You want to be a good dinner party host, so for this recipe, make sure you're well informed about who your participants are and what their main reason for participating is. You can ask them about their profession, expertise, motivation, and other questions and expectations via an online survey, in person, at an exploratory meeting at their school, etc. With the right information, you can decide to take a slightly different approach beforehand. And, if you discover specific needs along the way, simply adapt your programme where possible.

During our camps, there were quite a few differences amongst our participants. Our first group consisted of teachers from a vocational college where pupils are trained for professions in the woodworking, furniture, or interior design sectors in the Netherlands. The other group was more varied, and consisted of people from different kind of education: primary and secondary education, vocational education, and some of teachers from the University of Applied Sciences. You can imagine, therefore, that during the first camp there was already a lot of expertise within the group concerning technical knowledge, certain software, and some of the machinery, while in the second group, there were a lot of participants who labelled themselves as 'beginner' in our online registration form.

An important piece of advice regarding the subscriptions: ask participants to come in pairs. This is, of course, not obligatory, but working this way will help ensure that your participants share their experience with a colleague, which will make it easier for them to apply the knowledge and experiences they gain back at their own school.

WORKSPACE

Sheridan et al. (in press) define "makerspaces" as "sites for creative production in art, science and engineering where people blend digital and physical technologies to explore ideas, learn technical skills and create new products." They argue that the heart of making involves "taking an idea and constructing it into some physical or digital form."

A workspace is, of course, equipped with the right machinery and tools. An ideal workspace is both inspiring and allows participants to make it their own for the time being. It invites everybody to grab materials and use them, to feel comfortable and safe, to work together, to experiment, to make mistakes and try again. It should be spacious: big enough to allow people to move around freely and to disengage when needed. Make sure participants can see the projects their peers are working on, too. This way, they'll see that other people often struggle with the same problems, and they can help each other out. Because the workspace is a place to learn new things, it shouldn't remind participants too much of their daily work or daily routines at all.

You can use these techniques to improve your communication towards and between others.

PITCH AND TEAM UP

just like to work on each other's project. As previously mentioned in Recipe #2, you can ask people to think of something they want to make ahead of time, or let them think of something on the first day. After your kick-off session, you should ask people to pitch their ideas. These ideas can be abstract like, for example, a problem they want to solve, a technique they want to explore, or a piece of art they want to make. The pitch can be simple, and is meant to invite or convince others to work on the same idea. People who have ideas in common or are enthusiastic about each other's idea can form teams. Although this might be a bit uncomfortable sometimes, the groups eventually form themselves; you don't need to do anything. It is part of the process. The size of the group doesn't really matter. However, having four group members tends to work well. It's just enough people to work on different aspects of the project, but not so many that it could slow down the process. Remember: cooking together is fun, but too many cooks spoil the soup!

TIME

To learn by making, you need time. Providing your participants with enough time allows them to fully dedicate themselves to the 'making process,' a practise that isn't linear and that naturally comes with ups and downs. Our participants were on their school holidays and could, therefore, dive into the process for four consecutive days. Four days is a good amount of time for creating an interesting learning curve, overcoming frustration, and allowing participants to keep going (even into the evenings) once they're in the flow of making and don't want to stop.

COMMUNICATION

Of course, all good chefs want to entice diners into their restaurant, dining room, or kitchen. For those cooking up a Maker Camp, this isn't always easy. Maker education can be hard to grasp at first if you're not familiar with it. So, in your communication, you need to make sure that you describe the 'why' of maker education, your approach, and provide people a taste of your planned programme without sharing exactly what you are going to do. In other words, provide your guests with a mouth-watering menu they won't be able to resist. One thing that should be clear from the beginning is that a Teacher Maker Camp is not just about learning how the machines work. Maker education is, before all else, about attitude and approach. And, last but not least, make clear that these four days are about curiosity and fun!

ICEBREAKERS

In a group where people don't really know each other, ice breakers can help to get them comfortable with each other in a short amount of time. Just keep a few exercises on the side in case you need them. For example, have people draw each others' portraits using a single line (without taking their pencils off the paper) and without looking at their paper. The results are always rather strange, messy, and funny. You can't do right or wrong. And if you ask people to choose their favourite portrait of themselves (and have them explain why), you not only get some hilarious situations, but also a quick, easy, and approachable way of getting to know each other

Introduction and Icebreaker

Design Kit - IDEO.org

There are many activities and tools to kickstart your creative session and get to know people. You can start with very simple questions to warm up and break the ice in the room.

Class 1:
Make It Real

01

Introductions and Icebreaker

15 minutes

As a human-centered designer, it's important to embrace the "maker" that's within you. Though you might not yet think of yourself as a tinkerer, this course will give you a chance to explore your inner craftiness. Take a few minutes to answer the questions below and then discuss your answers with your team.

1) What's your name?

2) Where do you work?

3) Why are you taking this course?

4) What would you like to learn during this course?

5) What was the last thing you made? How did that process of making and creating feel? What were some of the challenges you faced and how did you overcome them?

Marshmallow challenge

Teacher Maker Camp - Waag Society

Launch activities that involve an active participation to make people think with their hands.

WHAT

Accomplishing an individual and group task without verbal communication.

WHY

In maker education, there are no fixed answers. Teachers and students are discovering and learning together. Prototyping is key to seeing what works and what doesn't. It both reveals hidden assumptions at an early stage and is a way of discovering new ideas through making.

TIME

60 minutes

NECESSITIES

tape-measure; (online) stopwatch; and for each group: a table, a kit with 20 sticks of uncooked spaghetti, tape, marshmallow, string, and scissors

Optional: computer & projector to show an online video (TED talk on Marshmallow Challenge), presentation, flip chart, pencil, music

Instructions

- 1 Put a kit on each table and form groups of four.
- 2 Deliver clear instructions: "Build the tallest freestanding structure. The winning team is the one that has the tallest structure from the table-top surface to the top of the marshmallow. The entire marshmallow needs to be on top. Cutting or eating parts of it disqualifies the team! Use as much or as little of the sticks, tape, or yarn as you like. Spaghetti sticks can be broken."
- 3 Show the time on a screen that is visible to everyone. The challenge lasts 18 minutes. Put on some music and walk around the room during the challenge. Remind the teams of the remaining time, and raise the energy by calling out the teams that have a standing structure in the meantime.
- 4 When time runs out (count down!), everyone should take their hands off their structures. Check which teams are disqualified (i.e. not standing, no marshmallow on top, use of other material that was not in the kit, structure taped onto the table and, therefore, not freestanding) and identify the winning team by measuring the structures.
- 5 Discuss the importance of prototyping and the marshmallow as a hidden assumption in a project. "Kids typically do better than business school students in this challenge. Kindergarteners create taller and more interesting structures because they spend more time playing and prototyping. They naturally start with the marshmallow and stick in the sticks. The business school students spend the vast majority of their time planning the structure before they eventually build it, leaving almost no time to fix the design once they put the marshmallow on top."
- 6 "The marshmallow is a metaphor for the hidden assumptions of a (make) project: We think marshmallows are light and fluffy and easily supported by the spaghetti sticks, but when you actually try to build the structure, the marshmallows don't seem so light. The lesson in the marshmallow challenge is that we need to identify the assumptions in our project: "the material or machine will do what I want", "this is too difficult to do", etc.

Rocket challenge

Teacher Maker Camp - Waag Society

Power up the energy levels by simply having fun, why not?!

WHAT

Group challenge on building and launching your own rocket. The highest rockets wins, or give an originality prize for the most beautiful one.

WHY

For fun! Why not?! The nice thing about this challenge, like all other challenges, is that this is something teachers can immediately implement in their teaching when they go back to their schools.

TIME

30 – 45 minutes

NECESSITIES

Plastic bottle, cork, bicycle valve, bicycle pump, craft supplies.

Instructions

- 1 Make a small hole in the cork (using a hand drill). Put in the valve as tightly as possible.
- 2 Design and decorate your bottle.
- 3 Fill the bottle with water (about $\frac{1}{4}$ to $\frac{1}{3}$ full). Close your bottle with the cork
- 4 Place the bottle in an upright position on a launch platform (you could use a crate, for instance, or build one yourself). Now, attach the bicycle pump to the valve.
- 5 Empty and close off your launch area.
- 6 Ready for take of... pump... 5, 4, 3, 2, 1, go!

Create a project plan

Design Kit - IDEO.org

Create a project plan, stay organized and document all your activities. It will be easier later on to connect the dots creatively.

The Field Guide to Human-Centered Design



Create a Project Plan

Get organized, understand your strengths, and start identifying what your team will need to come up with innovative solutions.

As you set out to solve your challenge, you'll need to create a plan. This gives you a chance to think through all the logistics of your project, and even though they're bound to change as things progress, you'll be in much better shape if you can plan for what's ahead. Reflect on your timeline, the space you'll work in, your staff, your budget, what skills you'll need, trips you'll take, and what you'll need to produce. Getting a good handle on all of this information can keep you on track.

STEPS

TIME

60-90 minutes

DIFFICULTY

Moderate

WHAT YOU'LL NEED

Pen, paper, Post-its, calendar

PARTICIPANTS

Design team

- 01** | A good place to start is with a calendar. Print out or make a large one and put it up in your workspace. Now mark key dates. They could be deadlines, important meetings, travel dates, or times when your team members are unavailable.
- 02** | Now that you've got a sense of your timeline, look at your budget and staff. Do you have everything that you'll need? If you foresee constraints, how can you get around them?
- 03** | You'll need to get smart on your topic before you head into the field. Who should you talk to now? What will you need to read to be up to speed on your challenge?
- 04** | Answer questions like: When should my team head into the field? Will my team make one visit or two? Will our partners be visiting? Will we need to physically make something? How much time, money, and manpower will we need to produce it?
- 05** | Your project plan will change as things evolve, and that's perfectly OK. You can always amend things as you go but make sure that you're really thinking through your project before you start.

Create a project plan

Design Thinking for Educators



0-3 Create a Project Plan

GETTING STARTED

0-3 Create a Project Plan

The Design Thinking process is flexible and can integrate into your school structure and timing. The process can be run in a day, a week, a year, or more. What you put into the challenge determines what you get out of it. The depth of insight, opportunity areas, and level of concept refinement and impact will vary depending on the length of your project. For now, choose the timeline you'd like to begin working with. After getting started on the project, you may find that you'll want to evolve this plan to meet the needs of your design solutions.

Circle your Design Plan

DAY	MON	TUE	WED	THU	FRI	SEPTEMBER	OCTOBER	NOVEMBER
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31			1	2	3
4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30
31								

In a Day In a Week or Two Spread out over Months

Project Checklist

What do you need to get in place to enable you to get started on this project? Do you need to align schedules to conduct a challenge on a professional development day? Do you need to book space or request materials? Who do you want help from?

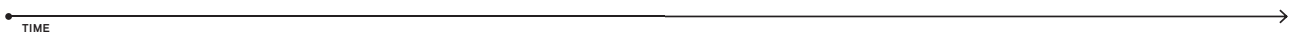
CHECKLIST

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TO HELP ME WITH PLANNING, I WILL ENGAGE:

Sketch your Timeline

Create a timeline for your project. What are major dates you'll be working toward? Do you need a prototype to be ready for use after summer break? Do you want to share learnings at parent-teacher night or pitch your concept to the school board? Consider deadlines, meetings, and interim check-in dates.



I WANT TO COMPLETE THE FIRST ITERATION OF THIS PROJECT BY:

Build Team

IDEActivity toolkit

Find a balance when combining different backgrounds, skills and personal preferences in order to have a variety of perspectives.



BUILD TEAM

Teamwork provides an excellent opportunity for creative production. Work in teams has extreme potential, as it gathers multiple points of view, supports the formation of a creative environment and the production of innovative and unexpected ideas. In fact, the ideative process is noticeably faster and more efficient when carried out with a group of people, as participants can build upon others' ideas naturally and in synergy.

The different phases of the design process often require diverse skill-sets, therefore structuring a targeted and multi-disciplinary team is extremely important to achieve the final goal. To reach the objective, assembling a team able to proactively take part in creative sessions is a key step. Each member's required expertise and role should be clearly determined, also considering his/her cultural background, knowledge and individual personality.

The team taking part in the creative session shall not necessarily be the same setting up and organizing the activities for the session, as the two phases may require different skill-sets.

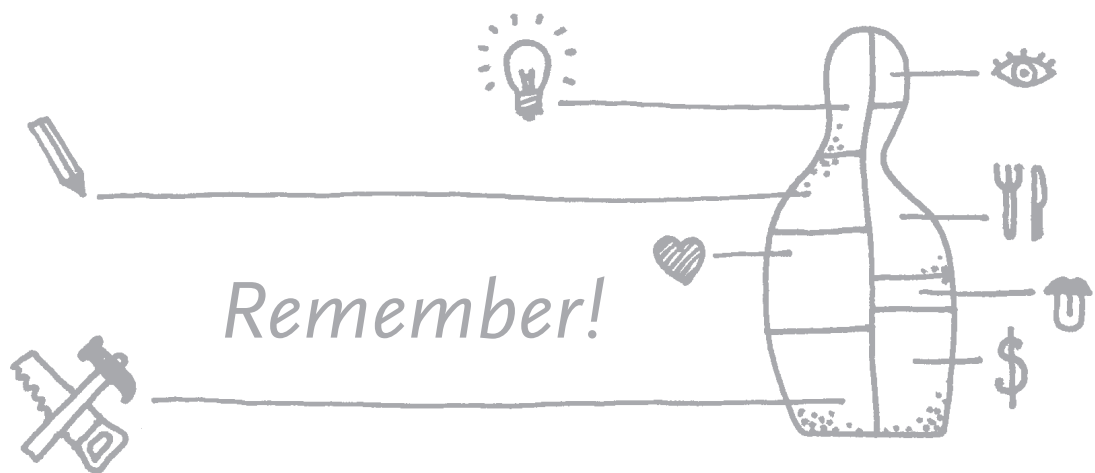
Tools

- *Skills & Needs*
- *Rings Net*

POLITECNICO
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IDEActivity toolkit



It is important not to underestimate the importance of the team with regard to each activity, reconfiguring the group, if necessary, to comply with specific requirements and goals. In assembling teams for creative sessions, it is important to select people with different skill-sets and expertise, who are used to working together and within multi-disciplinary environments.

Taking the goal and specific requirements of the project into consideration is essential when assembling the team to be involved in creative sessions. For example, it can be useful to involve stakeholders, users and experts from specific fields or trained in multiple sectors...

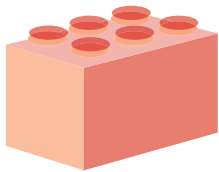
A diverse group guarantees the coexistence of multiple points of view, at the same time providing rhythm, vitality, and completeness to the creative session. However, it is not always easy to manage; therefore, the role of the facilitator must not be underestimated, both with regard to activity management and to promoting and maintaining a suitable creative environment.

Within diversified teams, in which members do not know each other, or are not used to working together, it is important to take the time to “break the ice”, getting to know each other (for example by having participants write down their individual know-how on post-its and share them with the group).

Build Team

Design Kit - IDEO.org

Consider your context in which you will be moving with your team and the project.



Build a Team

An interdisciplinary mix of thinkers, makers, and doers is just the right combination to tackle any design challenge.

Human-centered design works best with cross-disciplinary teams. You could put three business designers to work on a new social enterprise, but if you throw a graphic designer, a journalist, or an industrial designer into the mix, you're going to bring new modes of thinking to your team. It's smart to have a hunch about what kind of talent your team will need—if you're designing a social enterprise, a business designer is probably a good bet—but you won't get unexpected solutions with an expected team.

STEPS

- 01** | First, assess how many team members you'll need, your staff's availability, and when your project should start and end.
- 02** | Look at the core members of your team and determine what they're good at and what they're not so good at.
- 03** | Is there a clear technical capability that you'll need but don't currently have—maybe a mechanical engineer, a graphic designer, a skilled writer? Remember that you can always add a team member for a shorter period of time when their skills are most important.

TIME
60 minutes

DIFFICULTY
Hard

WHAT YOU'LL NEED
Pen, paper

PARTICIPANTS
Project lead, partner organizations

Recruiting people

Design Kit - IDEO.org

Who are your humans? Find them with a strategy, the information you will gather will be more of use.



Recruiting Tools

Human-centered design isn't just about talking to a lot of people, it's about talking to the right people. Build a strategy now so that your Interviews really count.

Before you start talking to the people you're designing for, it's important to have a strategy around who you talk to, what you ask them, and what pieces of information you need to gather. By planning ahead, and tracking who you talk to once you've done it, you can be sure to have the right balance of experts and laymen, women and men, people of different ethnicities and classes, as well as a full range of behaviors, beliefs, and perspectives.

STEPS

- 01** | As you start to determine who you want to talk to, think about a variety of factors: age, gender, ethnicity, class, social position. Who do you really need to hear from?
- 02** | Be sensitive to gender when making your Interview plan. Some communities may not be comfortable with men interviewing women. Or if you're working on a touchy topic, like open defecation, make sure that you understand social dynamics before you begin your Interviews (p. 39).
- 03** | Group Interviews (p. 42) can be a highly useful tool and also help you identify who you might like to speak more with in an individual Interview.
- 04** | Refer to Extremes and Mainstreams (p. 49) to make sure that you're talking to a broad spectrum of people.

TIME
30-60 minutes

DIFFICULTY
Moderate

WHAT YOU'LL NEED
Pen, paper

PARTICIPANTS
Design team

Mindset

Human Centered Design toolkit-IDEO

Having the right mindset is an important step in every design process and so it is for DIDIY. Follow these tools when you need to feed your creative thinking or refresh it.



Adopt the Mindsets

Human-centered designers are unlike other problem solvers—we tinker and test, we fail early and often, and we spend a surprising amount of time not knowing the answer to the challenge at hand. And yet, we forge ahead. We're optimists and makers, experimenters and learners, we empathize and iterate, and we look for inspiration in unexpected places. We believe that a solution is out there and that by keeping focused on the people we're designing for and asking the right questions, we'll get there together. We dream up lots of ideas, some that work and some that don't. We make our ideas tangible so that we can test


them, and then we refine them. In the end, our approach amounts to wild creativity, to a ceaseless push to innovate, and a confidence that leads us to solutions we'd never dreamed of when we started. In the Field Guide, we share our philosophy of design and the seven mindsets that set us apart: Empathy, Optimism, Iteration, Creative Confidence, Making, Embracing Ambiguity, and Learning from Failure.

Mindset

Human Centered Design toolkit-IDEO

66 **H** **C** **D**

Facilitator Notes

 **Time:**
20-40 mins.

 **Difficulty:**
★★★★★

Step 1: Ask the design team to look at the photo and identify what stands out to them. Note when people explain behaviors based on personal assumptions (i.e. "The man in the white lab coat seems to be the manager").

Step 2: Ask what past experience led to this explanation.

Step 3: Use 'opposite logic' to question the assumption the person has made (i.e. "Wouldn't those wearing lab coats need to be most sterile and therefore working closest with the machinery, not supervising?")

Step 4: Ask how the interpretation would change if a new piece of information were introduced (i.e. "What if I were to tell you that in this place white is the color that servants wear? How would you view this scene differently?").

Step 5: Ask the design team what they have learned from this exercise.

Step 6: Stress the importance of going into research with a "Beginner's Mind" and asking questions that you think you might already know the answers to, because you may be surprised by the answers.

Hear
Develop Your Mindset

STEP 6

DEVELOP YOUR MINDSET

The exercises listed under this step are valuable to put you in the right frame of mind for research. It is often difficult, but very important, for experts and professionals to put aside what they know when they conduct research. Keeping an open mind takes practice. The three exercises here can provide you with this practice before you go into the field:

- » Beginner's Mind
- » Observe vs. Interpret

MINDSET: BEGINNER'S MIND

Beginner's Mind is critical when entering a familiar environment without carrying assumptions with you that are based on prior experience. This is often very hard to do since we interpret the world based on our experience and what we think we know. This lens of personal experience can influence what we focus on and can make us unable to see important issues.



Remind yourself frequently of the need to approach your Design Challenge with Beginner's Mind, especially when you are in the field conducting research.



Here is one exercise to learn how to see the world through the eyes of a Beginner. Look at the photo on the opposite page and answer the following questions:

- » What stands out to you? What is happening?
- » What personal experience did you draw on when you looked at the picture?
- » How could you look at the photo as a Beginner, without making assumptions about what is happening?
- » What questions would you ask if you knew nothing about the context or activity of the people in the photo?

Mindset

Bootcamp Bootleg - Stanford

METHOD

ASSUME A BEGINNER'S MINDSET



WHY assume a beginner's mindset

We all carry our experiences, understanding, and expertise with us. These aspects of yourself are incredibly valuable assets to bring to the design challenge - but at the right time, and with intentionality. Your assumptions may be misconceptions and stereotypes, and can restrict the amount of real empathy you can build. Assume a beginner's mindset in order to put aside these biases, so that you can approach a design challenge afresh.

HOW to assume a beginner's mindset

Don't judge. Just observe and engage users without the influence of value judgments upon their actions, circumstances, decisions, or "issues."

Question everything. Question even (and especially) the things you think you already understand. Ask questions to learn about how the user perceives the world. Think about how a 4-year-old asks "Why?" about everything. Follow up an answer to one "why" with a second "why."

Be truly curious. Strive to assume a posture of wonder and curiosity, especially in circumstances that seem either familiar or uncomfortable.

Find patterns. Look for interesting threads and themes that emerge across interactions with users.

Listen. Really. Lose your agenda and let the scene soak into your psyche. Absorb what users say to you, and how they say it, without thinking about the next thing you're going to say.

Mindset

Bootcamp Bootleg - Stanford

SHOW DON'T TELL

Communicate your vision in an impactful and meaningful way by creating experiences, using illustrative visuals, and telling good stories.



FOCUS ON HUMAN VALUES

Empathy for the people you are designing for and feedback from these users is fundamental to good design.



CRAFT CLARITY

Produce a coherent vision out of messy problems. Frame it in a way to inspire others and to fuel ideation.



EMBRACE EXPERIMENTATION

Prototyping is not simply a way to validate your idea; it is an integral part of your innovation process. We build to think and learn.



BE MINDFUL OF PROCESS

Know where you are in the design process, what methods to use in that stage, and what your goals are.



BIAS TOWARD ACTION

Design thinking is a misnomer; it is more about doing that thinking. Bias toward doing and making over thinking and meeting.



RADICAL COLLABORATION

Bring together innovators with varied backgrounds and viewpoints. Enable breakthrough insights and solutions to emerge from the diversity.

D.MINDSETS

Introduction

The process

Set up tools and techniques

- Explore tools and techniques

Generative tools and techniques

Future Implementation

Empathize

Bootcamp Bootleg - Stanford

MODE
EMPATHIZE

WHAT is the empathize mode

Empathy is the foundation of a human-centered design process. To empathize, we:

- **Observe.** View users and their behavior in the context of their lives.
- **Engage.** Interact with and interview users through both scheduled and short 'intercept' encounters.
- **Immerse.** Experience what your user experiences.

WHY empathize

As a human-centered designer you need to understand the people for whom you are designing. The problems you are trying to solve are rarely your own—they are those of particular users; in order to design for your users, you must build empathy for who they are and what is important to them.

Watching what people do and how they interact with their environment gives you clues about what they think and feel. It also helps you to learn about what they need. By watching people you can capture physical manifestations of their experiences, what they do and say. This will allow you to interpret intangible meaning of those experiences in order to uncover insights. These insights will lead you to the innovative solutions. The best solutions come out of the best insights into human behavior. But learning to recognize those insights is harder than you might think. Why? Because our minds automatically filter out a lot of information in ways we aren't even aware of. We need to learn to see things "with a fresh set of eyes" – tools for empathy, along with a human-centered mindset, is what gives us those new eyes.

Engaging with people directly reveals a tremendous amount about the way they think and the values they hold. Sometimes these thoughts and values are not obvious to the people who hold them. A deep engagement can surprise both the designer and the designee by the unanticipated insights that are revealed. The stories that people tell and the things that people say they do—even if they are different from what they actually do—are strong indicators of their deeply held beliefs about the way the world is. Good designs are built on a solid understanding of these kinds of beliefs and values. Engage to:

- Uncover needs that people have which they may or may not be aware of
- Guide innovation efforts
- Identify the right users to design for
- Discover the emotions that guide behaviors

In addition to speaking with and observing your users, you need to have personal experience in the design space yourself. Find (or create if necessary) experiences to immerse yourself to better understand the situation that your users are in, and for which you are designing.

:: 1 ::

d.

Immersion

Design Kit - IDEO.org



Immersion

There's no better way to understand the people you're designing for than by immersing yourself in their lives and communities.

The Inspiration phase is dedicated to hearing the voices and understanding the lives of the people you're designing for. The best route to gaining that understanding is to talk to them in person, where they live, work, and lead their lives. Once you're in-context, there are lots of ways to observe the people you're designing for. Spend a day shadowing them, have them walk you through how they make decisions, play fly on the wall and observe them as they cook, socialize, visit the doctor—whatever is relevant to your challenge.

STEPS

TIME

Ideally a full week

DIFFICULTY

Hard

WHAT YOU'LL NEED

If you're going into the field you'll need travel and accommodation

PARTICIPANTS

Design team, people you're designing for

- 01** | As you Create a Project Plan (p. 34), budget enough time and money to send team members into the field to spend time with the people you're designing for. Try to organize a homestay if possible.
- 02** | Once you're there, observe as much as you can. It's crucial to record exactly what you see and hear. It's easy to interpret what's in front of you before you've fully understood it, so be sure you're taking down concrete details and quotes alongside your impressions.
- 03** | A great Immersion technique is to shadow a person you're designing for a day. Ask them all about their lives, how they make decisions, watch them socialize, work, and relax.
- 04** | If you've got a shorter window for Immersion, you can still learn a lot by following someone for a few hours. Pay close attention to the person's surroundings. You can learn a lot from them.

Immersion

Design Kit - IDEO.org

Immersion

Immersion can be divided into two phases: Preliminary and In-Depth. The main objective of the first phase is to reframe the problem and arrive at an initial understanding of it, while the second phase aims at identifying the needs and opportunities that will lead to a solution in the next stage of the project, Ideation.

Preliminary Immersion consists of Reframing, Exploratory Research and Desk Research. Everything begins with strategic alignment meetings between members of the team that will lead the Design Thinking project and employees of the client company, where the reframing process is undertaken. In parallel, the project team conducts a preliminary field survey – Exploratory Research – to illuminate the context of the subject in question and identify extreme behaviors that can be examined in greater depth in a second phase of Immersion.

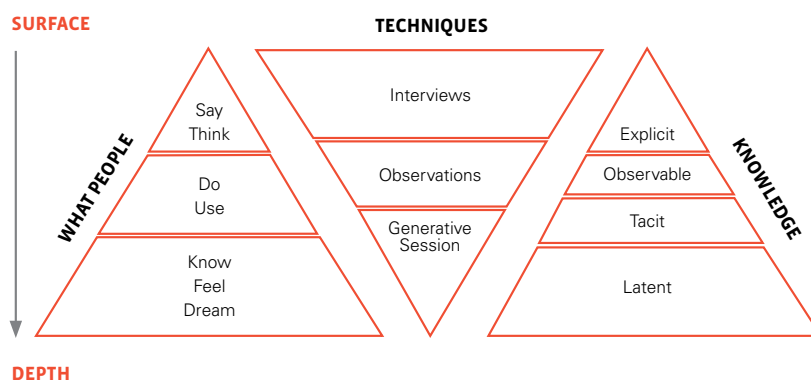
Simultaneously, Desk Research provides data on trends in the area under review in Brazil and abroad, as well as input on analogous themes that may help to elucidate the subject at hand.

Thus the aim of Preliminary Immersion is to define the scope of the project and its boundaries, and also to identify profiles for users and other key players that will have to be addressed. In this phase, it is also possible to survey areas of interest that call for exploration, so as to provide raw materials for development of the themes that are to be investigated in the In-Depth Immersion.

The In-Depth Immersion stage begins with the preparation of a Research Plan, including primary research protocols, a listing of profiles for users and key players to recruit and map out the contexts to be examined. Many techniques – some from Anthropology, such as Interviews, Generative Sessions, Cultural Probes, and so on – can be used to dive into the contexts of use interaction with products and services explored in the project.

Each technique is chosen on the basis of what the project seeks to achieve, as shown in the graphic below (Sleeswijkvisser et al., 2005). In the field, the agents engaged in these interactions are approached for a better understanding of their concerns, needs and values.

After Immersion in the universe of product/service use, and examination of trends in the market where the company operates, the data collected is analyzed, combining information to identify patterns and opportunities. At this point the data is visually synthesized to provide inputs for the Ideation phase. In other words, at the end of the Immersion phase, the data from the Preliminary and In-Depth Research is compiled, its main findings are distilled on Insight Cards, and translated into tools such as Personas, Blueprints, Conceptual Maps and so on, which will be used to generate solutions.



Preliminary Immersion

Design Thinking book - MJV

Immersion:

Preliminary Immersion

When a Design Thinking project begins, usually the team is not familiar with the subject. Therefore, a Preliminary Immersion is undertaken as a way of approaching the problem, often before the project kick-off.

This stage begins with a Reframing process in which the project team meets the client company staff, either in individual interviews or through group dynamics, to look at the problem from other perspectives and define project boundaries. The project team, moreover, will usually conduct an Exploratory Survey in the field to hear about the subject so it can arrive at an initial understanding of the users and stakeholders enmeshed in the context and help to define the key profiles to be looked at next, in the In-Depth Research. The team also undertakes Desk Research to discover trends on the subject in Brazil and abroad.

REFRAMING

WHAT IS IT?

It is an examination of a company's unsolved problems and issues from different perspectives and numerous angles, making it possible to deconstruct beliefs and assumptions of the players (stakeholders), and break down their thought patterns, helping them to change paradigms within the company and, in doing so, take the first step towards achieving innovative solutions.

WHEN TO USE IT?

Because a problem cannot be solved using the same kind of thinking that gave rise to it, reframing must be undertaken as a first phase in generating innovative solutions. This also serves as an initial stage to improve products, services and/or processes, since it makes it possible to approach the issue from new perspectives.

Design Thinking book - MJV

**HOW TO
APPLY IT?**

The reframing process occurs in cycles of capture, transformation and preparation, which repeat themselves until the objective is achieved. The goal is to stimulate all parties involved to see the problem from different points of view, creating a new understanding of the context in order to lead to the identification of innovative paths. Usually, the project team acts as facilitator of a process whose duration may vary, from a single workshop to several weeks. The important thing is for the meetings to take place where participants can be questioned and assigned small tasks to encourage new thinking patterns.

**Capture**

This is the collection of data about the purpose of the product/service/ company in terms of the beliefs and assumptions of the subject that are to be used in the transformation phase. Capture frequently occurs during encounters or meetings with the actors involved in the process, where, at the outset, they are asked questions (interviewed) about innovation, though they may also be prompted to engage in analogy exercises, staging or other dynamics to arrive at a different view of the issue.

**Transformation**

With data in hand, transformation is accomplished by the project team, which surveys the data collected in the previous phase and adds new perspectives. In this phase, a variety of techniques may be applied, such as mind maps, journeys, denial and so on, depending on the objective, client type, and stage of the process.

**Preparation**

Preparation is the moment when materials for impact awareness are created based on the result of the transformation phase, and are used to stimulate the parties to reflect. Frequently, issues that need clarification are raised, and tools for the next cycle (back to capture) are developed/chosen.

In-Depth Immersion

Design Thinking book - MJV

Immersion:

In-Depth Immersion

This research involves diving deeply into the context of the lives of the players and the subject under study. In general, there is an attempt to focus on the human dimension with the aim of retrieving four different types of information:

1. What do people say?
2. How do they act?
3. What do they think?
4. How do they feel?

The idea is to identify extreme behaviors and map their patterns, as well as people's latent needs. The research is qualitative and does not seek to provide exhaustive knowledge on consumption and behavior segments, but by gathering opportunities to compile extreme profiles, it allows the creation of specific solutions. Often these solutions cater to other groups, but they would not have emerged if scrutiny had not been trained on the differences.

To this end, project team members meet clients or users of the product or service in question to observe or interact with them in the context of use, to get a feel for their point of view and find out not only what they have to say, but also what they are doing and how they are feeling. The time is taken to get to know their lives so as to develop empathy, better understand their points of view, and thus identify their beliefs, concerns and needs. There are a number of techniques for conducting this research, such as: Interviews, the photographic record, Participant observation, Indirect observation, Cultural probes and so on. Some of them are explained in greater detail below.

Creating a design goal

The Delft Design Guide

2.1 Creating a Design Goal

A product design process is preceded by a product planning process, as was explained in the first part of this reader. In the product planning process, policies are formulated based upon an internal and external analysis of the market and the company. The product planning process ends with the formulation of a design brief, which forms the start of the product design process. Sometimes the product ideas are already mentioned explicitly in the design brief, and sometimes the product design process starts with a search for relevant product ideas. In any case, the product design process always begins with a stage in which the design problem (or challenge) will be analysed.

A first description of the design problem is stated in the design brief. The analysis of the design problem serves the formulation of a design goal or goals. Hence this first section of design methods: creating a design goal. Design goals are broad declarations of intent that can be elaborated into more specific goals. For instance, the designer could study the motivation of the problem owner, the need in the market, the context in which the product is used, competitive products, user behaviour, the product's functions, the company's production facilities etc. After this analysis, conclusions are drawn, which are often in the form of requirements, a design philosophy, a mission statement, or a product vision. In this section, creating a design goal, various methods are presented that facilitate the first stage of a design process: the analysis of the design problem, and the formulation of a design specification.

Analysis and synthesis

Design Thinking book - MJV

Analysis and synthesis

INSIGHT CARDS

WHAT ARE THEY?

Insight cards are reflections based on real data from the Exploratory, Desk and In-Depth Research, transformed into cards that facilitate quick consultation and handling. Generally they include a title that summarizes the finding and the original text collected in the research, along with the source. In addition, other codification may be relevant, such as place of collection, the moment to which it refers in the life cycle of the product/service, and so on, to facilitate analysis.

WHEN TO USE THEM?

During meetings for the creation of the Affinities Diagram to identify data patterns and interrelationships; also useful for creating a summary map of the Immersion phase, as well as in collaborative ideation sessions to unlock the flow of ideas. Creating a solution may involve choosing more than one insight.

HOW TO APPLY THEM?

In the course of Desk Research, whenever an issue relevant to the Project is identified, it is noted on a card where the main finding, the source and the explanation of the issue are recorded. For field research, on the other hand, cards are usually created when researchers come back "home" and retrace what they have seen and heard by recording the most striking issues. In addition, insights may also arise in the course of Immersion during the project team's **debriefing** meetings where the experience of various researchers is compared, and opportunities are registered.

Debriefing: The term is used here to express the moment when what was seen in the field is shared with the Project team – that is, when a story is told recounting the main topics observed in the field. In psychology and advertising, the term can have a different meaning.

IDEActivity cards

IDEActivity toolkit



IDEACTIVITY CARDS

In the IDEActivity method, once the goal has been clarified and the opportunities and goal have been defined, the set up phase begins with the creation of a set of cards, inspired by the IDEO Method Cards, to be used during the creative session to elicit the generation of ideas. The structure of the cards is based on the ones developed by IDEO, however they are substantially different. As opposed to IDEO, in IDEActivity, the cards are created ad hoc for each creative session, and are linked to the project's objective.

The cards are divided into 4 categories: Ask, Look, Learn, and Try, depending on the approach and type of information sought after.

PROCEDURE

- *Make a list of information/activities to be investigated, and divide them among the 4 categories depending on the approach: Ask, Look, Learn and Try.*
- *Each card has two faces: one is visual, and depicts an evocative image, the other is textual, and includes the title and category of the activity, the way it should be carried out, and what should be taken from the experience (“How?” and “Why?”)*
- *Design and create at least one card for each category, selecting an evocative image and briefly describing the activity.*

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PARTICIPANTS

1 - 4 people

DURATION

from a minimum
of 4 hours to some
days

WHAT NEXT?

· CSPlan

IDEActivity cards

IDEActivity toolkit



Guidelines

1. Setting off from the activities carried out during EXPLORE, identify interesting information and elements to be investigated further, determining what approach to employ to elicit idea generation during the creative session.

2. Based on the 4 categories, imagine activities fit for each category. Ask (involve people to elicit information that is useful for the project); Look (observe the people to understand “what they are doing”); Learn (analyse the information gathered so as to identify the scope of the project); Try (suggest simulations with the objective of identifying with people and concretely assessing any intuition/suggestion, or determining the scope of the project).

3. Design the 4 IDEActivity cards using sketches/images and very brief texts addressing the How (what type of activity should be carried out) and the Why (what goal should be achieved). It is useful to produce at least one card for each category. It might be helpful to prepare a higher number of Try cards.

4. In designing the cards, activities eliciting lateral thinking should be suggested, which help prompt unusual and potentially innovative connections, solutions and ideas.

5. The evocative image on the front of the card is an important aid in illustrating the activity set out on the back, and should inspire the way in which it is carried out. It is important that the images be unambiguous, and more empathic than iconic. They can be produced using various techniques (see Image Telling as well).



Card sort

Design Kit - IDEO.org



Card Sort

This simple exercise will help you identify what's most important to the people you're designing for.

A Card Sort is a quick and easy way to spark conversation about what matters most to people. By putting a deck of cards, each with a word or single image, in someone's hands and then asking them to rank them in order of preference, you'll gain huge insight into what really counts. You can also use the Card Sort exercise to start a deeper conversation about what a person values and why.

STEPS

TIME

30 minutes

DIFFICULTY

Easy

WHAT YOU'LL NEED

Premade cards on p. 168 or your own cards

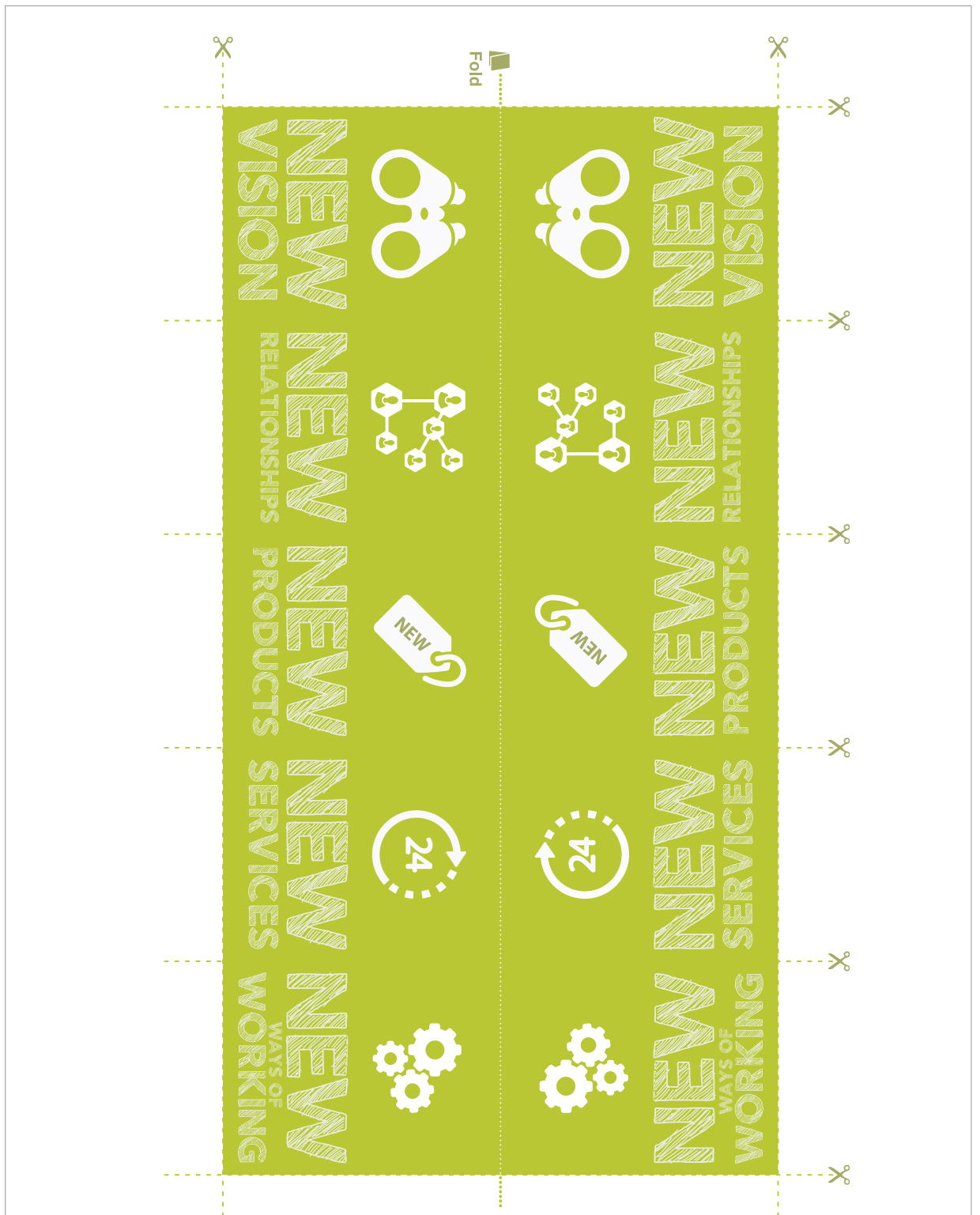
PARTICIPANTS

Design team, person you're designing for

- 01** | Make your own deck of cards or use the cards provided in the Resources section on p. 168. If you're making your own cards, use either a word or a picture on each card. Whatever you select, make sure that it's easy to understand. Pictures are a better choice if the person doing the Card Sort speaks another language or cannot read.
- 02** | When tailoring your deck of cards to your precise research objectives, be sure that you're mixing concrete ideas with more abstract ones. You can learn a lot about how the person you're designing for understands the world by making this exercise more than just a simple ranking.
- 03** | Now give the cards to the person you're designing for and ask her to sort them according to what's most important.
- 04** | There are a couple variations on this Method that work nicely: Instead of asking the person you're designing for to rank the cards in order of preference, ask her to arrange them as she sees fit. The results might surprise you. Another tweak is to pose different scenarios. Ask the person you're designing for how she would sort the cards if she had more money, if she were old, if she lived in a big city.

Gameboard Card

Co-creation toolkit - Waag Society



WWWWWH

The Delft Design Guide

What Is ‘Who, What, Where, When, Why, and How’?

Analysing a problem means obtaining a thorough understanding of the problem, its stakeholders and the facts and values involved. An important notion in problem analysis is deconstruction of the problem: by asking yourself a multitude of questions (about the stakeholders, facts, etc.), you are able to deconstruct the problem systematically. Consequently, you can review the problem and set priorities. There are several methods available for analysing a problem systematically, one of which is WWWWWH (who, what, where, when, why, and how?). Another method is breaking down the original problem into means-end relationships.

When Can You Use ‘Who, What, Where, When, Why, and How’?

Problem analysis is one of the first steps in a design process, right at the beginning of a design project.

How to Use ‘Who, What, Where, When, Why, and How’?

Starting Point

Define the preliminary problem or draft a design brief

Expected Outcome

The outcome you can expect is that you will get greater clarity about the problem situation (the problem context), you will gain a better understanding of the stakeholders, facts and values of the problem, and more insight into problems underlying the initial problem.

Possible Procedure

- 1 Write down the initial design problem in brief statements.
- 2 Ask yourself the following WWWWWH questions in order to analyse the initial design problem. Perhaps you can find more questions yourself: Who are the stakeholders? Who has the problem? Who have an interest in finding a solution? What is the problem?

What has been done to solve the problem? Why is it a problem? Why is there no solution? When did the problem occur? How did the problem come about? How did (some of) the stakeholders try to solve the design problem?

- 3 Review the answers to the questions. Indicate where you need more information.
- 4 Prioritise the information: what is important? why?
- 5 Rewrite your initial design problem (see also ‘Problem Definition’ in this section)

Tips and Concerns

- Who: mention as many people as possible that are involved with the problem
- What: think also about the problems behind the problem. Try to find the essence of the problem.
- You can also ask “What for”.

References and Further Reading



Identify Patterns

Human Centered Design toolkit-IDEO

94 H C D

Create
Identify Patterns

STEP 3

IDENTIFY PATTERNS

Making sense of your research is accomplished by seeing the patterns, themes, and larger relationships between the information. This process can be messy and difficult at times, but ultimately very rewarding. Seeing the patterns and connections between the data will lead you quickly toward real-world solutions. There are several steps listed here to take you through the process for you use selectively based on the subject matter.

- » Extract Key Insights
- » Find Themes
- » Create Frameworks

Facilitator Notes

 **Time:**
45-60 mins.

 **Difficulty:**
★★★★☆

Step 1. Ask the team to go to the wall with all the stories and choose 5 key post-its (stories, quotes, observations) that are most surprising, interesting, or provocative.

Step 2. Group these into related thoughts.

Step 3. Write a succinct Insight statement on a new post-it for each grouping that summarizes the big takeaway.

Step 4. Post these Insight post-its where all can see.

METHOD: EXTRACT KEY INSIGHTS

Uncovering insights is about bringing visibility and clarity to previously hidden meaning.

WHAT IS AN INSIGHT?

- » Insights are revelations – the unexpected things that make you sit up and pay attention.
- » Insights extrapolate individual stories into overarching truths.
- » Insights allow us to see our design challenge in a new light.

For example, a combination of an observation and quote from an interview yielded the following sample insight:

Observation: Farmers rely on farming information from their friends and neighbors, though they know this knowledge is limited.

Quote: “If the Privatized Extension Agent lived outside my area, I would want to visit his farm so I could see his production.”

Insight: Trust-building and knowledge sharing happens through ‘seeing is believing.’

Human Centered Design toolkit-IDEO

TIP
#1**Select key information**

Look across the information in the stories. Edit out the details that are not important - this is the time to let go of some of the detail. Choose the information that you find surprising, interesting, or worth pursuing.

TIP
#2**Aggregate big thoughts**

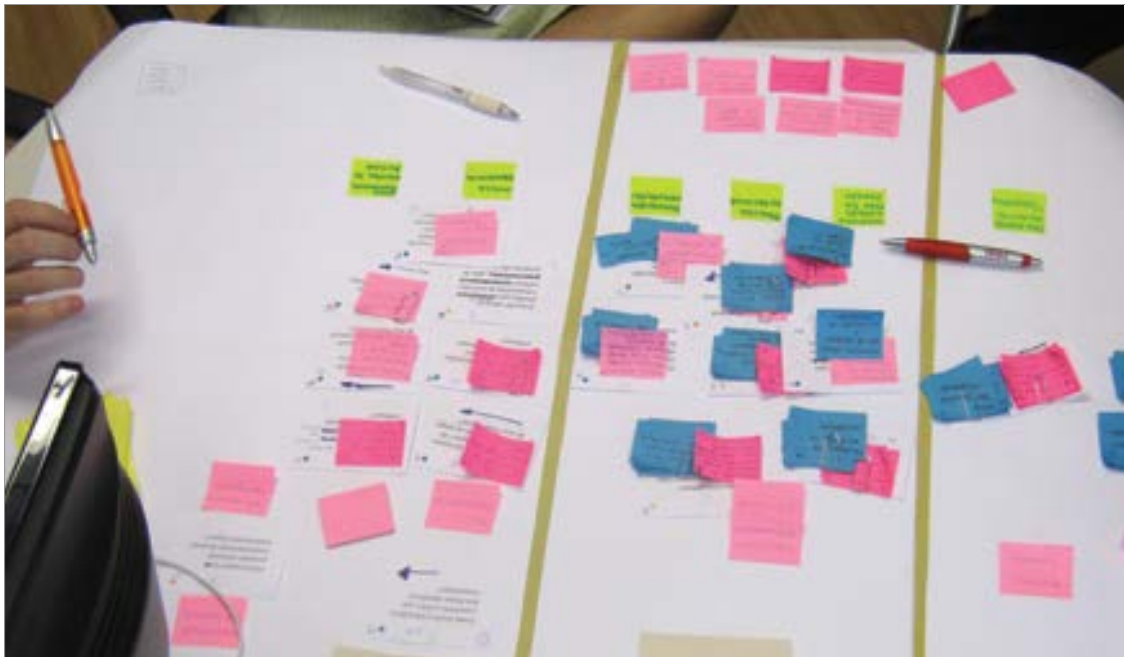
Are some of the thoughts linked? If so, aggregate them. Take several related pieces of information and re-write them as one big Insight.

TIP
#3**Work at the same level**

Check that the insights sit at the same level - that they are all big thoughts. If you find you have some lower level insights, consider whether they might be reframed at a higher level. If they need to be dropped a level, they may be best talked about as customer needs that inform and support the Insight.

Affinity diagram

Design Thinking book - MJV



AFFINITY DIAGRAM

WHAT IS IT?

It is organizing and grouping Insight Cards based on affinities, similarities, dependency or proximity, creating a chart containing the macro areas that mark the boundaries of the subject under consideration, its subdivisions and interdependencies.

WHEN TO USE IT?

When there is a large amount of data coming in from research (desk and/or field research), to identify connections among subjects, and windows of opportunity for the project.

HOW TO APPLY IT?

After going out into the field, and when Desk Research is finished, working without any preconceptions, you have obtained a mass of data with the most significant findings tagged on Insight Cards. They are arranged on a desk, on the floor or even posted on the wall by a multidisciplinary team working in a collaborative fashion, so that no single bias prevails in the analysis. In this process, subjects, subgroups and criteria are often identified that assist in understanding the data. The arranging can be redone a number of times by different groups, depending on the complexity of the subject and the volume of data. The important thing is for each stage to be recorded, and for the result to help with the understanding of the field data, and with the creation of tools to be used in Ideation.

Saturate and Group

Bootcamp Bootleg - Stanford

METHOD

SATURATE AND GROUP



WHY saturate and group

You space saturate to help you unpack thoughts and experiences into tangible and visual pieces of information that you surround yourself with to inform and inspire the design team. You group these findings to explore what themes and patterns emerge, and strive to move toward identifying meaningful needs of people and insights that will inform your design solutions.

HOW to saturate and group

Saturate your wall space (or work boards) with post-its headlining interesting findings (see “Story Share-and-Capture”) plus pictures from the field of users you met and relevant products and situations.

In order to begin to synthesize the information, organize the post-its and pictures into groups of related parts. You likely have some ideas of the patterns within the data from the unpacking you did when producing the notes. For example, you may have seen and heard many things related to feeling safe, and many things regarding desire for efficiency. Within the group of ‘safety’, go beyond the theme and try to see if there is a deeper connection that may lead to an insight such as “Feeling safe is more about who I am with than where I am”. Maybe there is a relation between groups that you realize as you place items in groups - that safety is often at odds with users’ desire for efficiency. Try one set of grouping, discuss (and write down) the findings, and then create a new set of groups.

The end goal is to synthesize data into interesting findings and create insights which will be useful to you in creating design solutions.

It is common to do the grouping with post-its headlining interesting stories from fieldwork. But grouping is also useful to think about similarities among a group of products, objects, or users.

Find Themes

Human Centered Design toolkit-IDEO

98 **H** **C** **D**

Create
Identity Patterns
Method: Find Themes

Facilitator Notes

Time:
30-60 mins.

Difficulty:
☆☆☆☆☆

Step 1. Have the team go to the wall or board where they have placed their key story and insight post-its and select the 5 most interesting quotes, observations and/or insights.

Step 2. On a new board, sort these into themes.

Step 3. Check to make sure the themes are at the same level. If a theme is too specific, prompt the team to find the bigger idea. If a theme is too broad or has too many different ideas under it, ask them to break it down into several buckets.

Step 4. When finished sorting, give each theme a title on a new post-it. Make sure there is enough space between or below the different theme categories to facilitate the next step of opportunity identification.

STEP
3

METHOD: FIND THEMES

Finding themes is about exploring the commonalities, differences, and relationships between the information.

Some ways to do this include:

Look for categories and buckets

Sort your findings into categories or buckets. Which ideas are related? Cluster together the findings that belong together into themes.

Consider the relationship between categories

Look for patterns and tensions in the way your themes relate to each other. Are they on the same level? Or are they talking about different kinds of things?

Group and re-group

Slice and dice the data in different ways to find meaning. Try moving the post-its around to form new groups.

Get input from the team

Explain the early buckets and themes to a broader group. Learn from their input and try alternative groupings.



TRY

Try the P.O.I.N.T. technique

Translate the Problems and Needs identified in storytelling into Insights (see previous Method) and Themes.

P = Problems
O = Obstacles
I = Insights
N = Needs
T = Themes

Define

Bootcamp Bootleg - Stanford

MODE

DEFINE

WHAT is the define mode

The define mode is when you unpack and synthesize your empathy findings into compelling needs and insights, and scope a specific and meaningful challenge. It is a mode of “focus” rather than “flaring.” Two goals of the define mode are to develop a deep understanding of your users and the design space and, based on that understanding, to come up with an actionable problem statement: **your point of view**. Your point of view should be a guiding statement that focuses on specific users, and insights and needs that you uncovered during the empathize mode.

More than simply defining the problem to work on, your point of view is your unique design vision that you crafted based on your discoveries during your empathy work. Understanding the meaningful challenge to address and the insights that you can leverage in your design work is fundamental to creating a successful solution.

WHY define

The define mode is critical to the design process because it explicitly expresses the problem you are striving to address through your efforts. In order to be truly generative, you must first craft a specific and compelling problem statement to use as a solution-generation springboard.

As a test, a good point of view (POV) is one that:

- Provides focus and frames the problem
- Inspires your team
- Provides a reference for evaluating competing ideas
- Empowers your team to make decisions independently in parallel
- Fuels brainstorming by suggesting “how might we” statements
- Captures the hearts and minds of people you meet
- Saves you from the impossible task of developing concepts that are all things to all people
- Is something you revisit and reformulate as you learn by doing
- Guides your innovation efforts

:: 2 ::
d.

Define Opportunity

IDEActivity toolkit



DEFINE OPPORTUNITY

To define opportunities it is essential for the goal to be fully understood. Opportunities hinge upon a consistent basis of research. Through different approaches, research can reveal valuable information providing potential opportunities, in ways that are unexpected at times.

Only promising aspects of the goal should be investigated, and restated as questions to be addressed during the creative phase.

This practice trains participants' intuition and awareness, using tools that prompt new avenues of consideration, and gives shape to the project's scope, providing relevant and viable opportunities.

A good opportunity is defined not only by assessing its context, but also by identifying its potential user and target market.

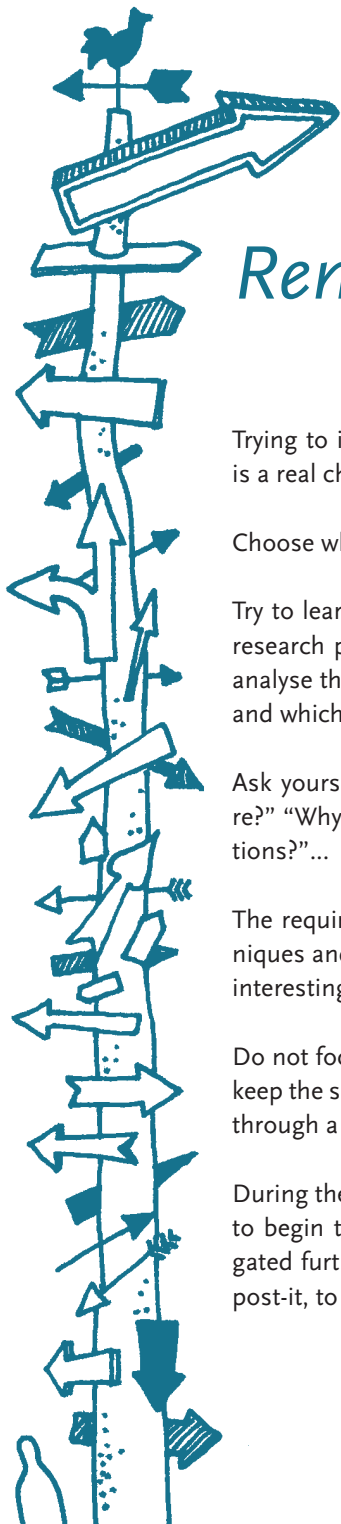
Tools:

- *Personas*
- *Scenario*
- *Image Telling*
- *Cross*



Define Opportunity

IDEActivity toolkit



Remember!

Trying to identify which among the available ideas holds true potential is a real challenge.

Choose what surprises you! What do you find most exciting? Why?

Try to learn more about the information deemed important during the research phase, and to consider it from new perspectives. Specifically, analyse the information which seemed most interesting and surprising, and which contributed in clarifying the goal.

Ask yourself: "What have we learned that we hadn't thought of before?" "Why was this striking?" "Why is it more interesting than other options?"...

The required time must be spent on this phase, testing different techniques and ways of gathering knowledge on the information considered interesting, until something truly convincing has been reached.

Do not focus on the details too much: remember that it is important to keep the scope of the project broad. Be concise, defining the opportunity through a sentence/slogan that focuses intuitions towards the goal.

During the process defining opportunities, it will probably come natural to begin to suggest solutions and ideas. These should not be investigated further during this phase, but rather taken note of on paper or a post-it, to be used at a later stage (Generate phase).

Inspiration

Design Kit - IDEO.org



INSPIRATION

The Inspiration phase is about learning on the fly, opening yourself up to creative possibilities, and trusting that as long as you remain grounded in desires of the communities you're engaging, your ideas will evolve into the right solutions. You'll build your team, get smart on your challenge, and talk to a staggering variety of people.

THIS PHASE WILL HELP YOU ANSWER

How do I get started?

How do I conduct an interview?

How do I keep people at the center of my research?

What are other tools I can use to understand people?

Inspiration

Teacher Maker Camp - Waag Society

RECIPE #4

INSPIRATION

Take a look in someone else's kitchen

INGREDIENTS

SPEAKERS

FACULTY

INSPIRATION CORNER

CHALLENGES

WORKVISIT

You want to cook a meal that is rich in flavour, bright in colour, and that smells and looks like heaven. And you want to be surprised. To be inspired by the unconventional—even if that means finding peppers in your chocolate or olives in your carrot cake sometimes.

To accomplish this, don't be afraid to be generous with adding various elements of inspiration to your recipe.

Inspiration

Teacher Maker Camp - Waag Society

Annex I: inspiration

FEEL FREE
TO SHARE
THIS LIST.

STUFF THAT INSPIRED
US DURING
TEACHER MAKER CAMP

Here is an (incomplete) selection of books, videos and websites that inspire us.

- ✦ **Inspiring books**
 - Invent to Learn: vision and practical guide on maker education: <http://www.inventtolearn.com>
 - The Art of Tinkering: <http://tinkering.exploratorium.edu/art-tinkering>
 - Dangerous things for kids: <http://www.fiftydangerousthings.com/>
 - Computer science without a computer for kids: <http://csunplugged.org/>
- **Inspiring websites**
 - Tinkering school: <http://www.tinkering.school.com/>
 - Instructables: <http://www.instructables.com>
 - Etsy: <https://www.etsy.com>
 - Github: <https://github.com>
 - Make (magazine): <http://makezine.com>
 - Wired (magazine): <http://www.wired.co.uk/news/archive/2013-03/13/digital-fabrication>
 - Exhibition Power of Making V&A London/product design: <http://www.vam.ac.uk/content/articles/p/powerofmaking/>
 - NYC Makers, MAD Biennial New York: <http://madmuseum.org/exhibition/nyc-makers>
 - Textiel Museum, Textiel Lab: <http://www.textielmuseum.nl/en/>
- **Inspiring videos**
 - FabLab founder and visionary: <https://www.youtube.com/watch?v=aPbJmYCSCgA>
 - Maker the movie: <http://designthinkingmovie.com>
- + **Makers, ideas and instructions**
 - Exploratorium tinkering studio: <http://tinkering.exploratorium.edu/>
 - Tech for kids: <https://diy.org/>
 - Coding for kids: <http://www.helloruby.com>
 - FabLab projects: <http://fablab.waag.org/projects>
 - Smart textiles: <http://www.kobakant.at/DIY/>
 - Smart textiles: <http://etextilelounge.com/>
 - Tech & design: <http://www.instructables.com/>
 - Furniture designs: <http://makingsociety.com/2013/02/20-open-source-furniture-designs/>
- ✦ **Background information**
 - Makers Movement: https://en.wikipedia.org/wiki/Maker_culture
 - Maker Education: LINK

HAPPY! ☺

Inventor kits

xxx toolkit - Institute of Design at Stanford

MakeyMakey

makeymakey.com

Make electric circuits out of anything conductive! You can change everyday objects into 'touchpads' that can be used to control your computer. For some inspiration and to get started: [pinterest.com](https://www.pinterest.com) > search: MakeyMakey

Bare Conductive

bareconductive.com

Use the touch-triggered 'Touch Board', Electric Paint, and the Starter Kit to make interactive projects. It doesn't need to be connected to a computer or a circuit. For some inspiration and to get started: bareconductive.com/make

Hummingbird Robotics Kit

hummingbirdkit.com

Make anything into a light-up, moving, sensing robot. The kit consist of the Hummingbird Duo Controller, power, USB, a tool for attaching electronics, motors, sensors and LEDs. For some inspiration and to get started: hummingbirdkit.com/learning/tutorials

mBot

(kickstarter.com/imbot:

An educational robot consisting of 38 assembly parts to get hands-on experience with robotics, programming, and electronics.

Arduino

mouser.com

A kind of microcontroller that can be programmed. It has input and output ports to which you can connect a variety of sensors and actuators. For some inspiration and to get started: [fabschool.nl](https://www.fabschool.nl) > search: Arduino.

Arduino tinker kit

mouser.com

Design interactive environments and electronic prototypes without using a breadboard or breaking out the soldering iron. The kit consists of a Sensor Shield, cables, and various sensors and actuators. For some inspiration and to get started: arduino.cc/en or search for tutorials on YouTube.

LittleBits

littlebits.cc

Use the colour-coded magnetic building blocks, 'Bit modules', to create electronic circuits in seconds; and combine them with craft materials to make projects. For some inspiration and to get started: littlebits.cc/projects

SparkFun Inventors Kits (SIK)

Sparkfun.com

Start programming and working with hardware using the Arduino programming language. The SIK contains everything you need to make 15 circuits that will teach you how to control sensors and motors, display information on an LCD screen, and more. For some inspiration and to get started: a full-colour instruction booklet comes with the kit.

Tell Stories

Design Thinking for Educators

The image shows a digital workspace for a design thinking exercise. At the top, there is a toolbar with five icons: a pencil, a magnifying glass, a lightbulb, a gear, and a refresh symbol. The title '2-1 Tell Stories' is in the top right, and the word 'INTERPRETATION' is in the top right corner. The workspace contains several sticky notes with the following prompts:

- WHO DID YOU MEET? (PROFESSION, AGE, LOCATION, ETC)**
- What was the most memorable and surprising story?
- What was interesting about the way he/she interacted with his/her environment?
- What did this participant care about the most?
What motivates him/her?
- What frustrated him/her?
- What questions would you like to explore in your next conversation?

Download Your Learnings

Bootcamp Bootleg - Stanford



Download Your Learnings

In the Inspiration phase you gathered tons of information. Here's how you share it with your team and put it to use.

Now that you've got a huge amount of notes, photos, impressions, and quotes, it's time to start making sense of them. Because teamwork is so critical to human-centered design, IDEO.org teams download their learnings as groups. One by one, you'll go around the room, capture your ideas and stories on Post-its, and put them on big sheets of paper. It's critical to pay close attention to your teammates' stories, learnings, and hunches. This is a rich and powerful way to share what you've heard and part of the goal is to make your individual learnings group knowledge.

STEPS

- 01** | Take turns downloading. Start by getting rid of other distractions and sitting in a circle.
- 02** | When it's your turn, put all key information you want to share on Post-its and use them as you describe who you met, what you saw, the facts you gathered, and your impressions of the experience.
- 03** | Cluster the Post-its together as you put them on the wall or on a board so that you have a record of your discussion.
- 04** | When it's not your turn, pay close attention. Feel free to ask questions if something isn't clear.
- 05** | This process is best done the day of an Interview (p. 39) or after a day in the field. Download while your experiences and perceptions are fresh.

TIME

30 minutes per download

DIFFICULTY

Moderate

WHAT YOU'LL NEED

Pens, Post-its, a wall or board

PARTICIPANTS

Design team

Recognize existing Knowledge

Human Centered Design toolkit-IDEO

Remember “you are your greatest asset” (Tom Hopkins), so start from what you and your team already know and build your process upon that knowledge.

H C D 39

Hear
Recognize Existing
Knowledge

STEP 2

RECOGNIZE EXISTING KNOWLEDGE

Chances are good that you already have some knowledge about the topic. Conducting a “What Do We Know?” session helps call forth existing knowledge related to the Design Challenge. Once documented, you can freely focus on discovering what you don’t yet know.



TRY

First, on Post-Its, write down what you already know about the Design Challenge, including:

- » What people need or want
- » What technologies can help in this challenge
- » What solutions or ideas are being tried in other areas
- » Any early hypotheses about how to solve the Design Challenge

Are there any contradictions or tensions that emerge? Where is the team’s knowledge the strongest: on the needs of people, on the technological possibilities, or in how to implement ideas?

Next, write down what you don’t know but need to learn about the area of investigation, such as:

- » What constituents do, think, or feel
- » How people value offerings
- » What constituents’ future needs may be
- » Challenges to implementation of ideas

Where are the biggest needs for research?
How should the recruiting strategy be tailored?
Which categories might structure the discussion guide?

Facilitator Notes

Time:
30-60 mins.

Difficulty:
★★★★☆

Step 1: Post the design challenge so that the team can see it.

Step 2: Hand out post-it notes to the design team, and ask them to write what they already know about the topic. Have one piece of information per post-it note.

Step 3: Ask each person to read their notes, and post them under the design challenge. Ask others to disagree or challenge any of the assumptions that come out.

Step 4: Ask the team to write down on post-it notes what they don’t know about the challenge and read their notes. Post these notes in a different area.

Step 5: Group the post-it notes into themes to help the team develop research methods, a recruiting plan, and the interview guide.


Create opportunity areas

Human Centered Design toolkit-IDEO

102   

Create
Create Opportunity Areas

Facilitator Notes

 **Time:**
40 mins.-2 Hours

 **Difficulty:**
★★★★☆

Step 1: Prepare your team to begin defining opportunity areas by telling them that this is where they will start to shift from analysis of information to creating new ideas.

Step 2: Distribute post-it notes and markers to everyone in the team. Ask the team to start their opportunities with the words “How Might We...?”

Step 3: Spend at least 15 minutes on each theme generating Opportunity Statements for that theme. Place the post-its next to the theme area.

Step 4: If the team gets stuck, read the insights from each theme area as a way to jolt the creativity of the team. For example, for each insight posted, ask the team to come up with at least one “How Might We...” statement.

STEP 4

CREATE OPPORTUNITY AREAS

Once you have pulled out the themes and patterns from what you heard, you can start creating opportunity areas. The process of translating insights into opportunities is about moving from the current state to envisioning future possibilities. Opportunities are the springboard for ideas and solutions.

WHAT IS AN OPPORTUNITY AREA?

- » An opportunity area is a stepping stone to idea generation.
- » An opportunity is a rearticulation of problems or needs in a generative, future facing way.
- » An opportunity area is not a solution. Rather, it suggests more than one solution. It allows the team to create many solutions.

FRAMING OPPORTUNITY AREAS

Opportunities start with the phrase “HOW MIGHT WE...?” to suggest a mindset of possibility.



TIP
#1

Start each statement with “HOW MIGHT WE...?” and abbreviate on post-its to “HMW.”



TIP
#2

Use different color post-its for your opportunity statements than you used for insights. This will help to visually separate insights from opportunities for the next step.

Human Centered Design toolkit-IDEO

MARKET INFO
y to research all products in market

AG KNOW-HOW

HMW provide real time

HMW... INFO ACCESSIBLE

POST-PROCESSING PRACTICES

HMW co farmers national

crop - insect and rats - are a problem. Want

WATCH OUT
Watch out for opportunity areas that are already solutions. A key part of creating innovative solutions is preventing yourself and your team from jumping to conclusions.

TIP #3
Go for quantity, not quality at this point.

TIP #4
When narrowing down the opportunity statements to 3-5 HMW statements to use in brainstorming, select some that are intentionally outside of your current projects or capabilities. At this point, filter based on Desirability to customers, not Feasibility to the organization.

TRY
If your opportunity sounds like a specific solution, back it up by asking yourself, "Why would we want to offer this solution?" or "What user needs are answered by this solution?" Here is an example:
Insight
Trust building and knowledge sharing happens through 'seeing is believing.'
Solution
A training course offered by community members to teach their friends and neighbors about a technology or behavior that has worked for them. This is a solution.
Ask yourself: What needs are answered by this solution?
Answer: The need to expand the knowledge of community members through local information aggregators.
Opportunity
How might we better educate and inform local knowledge aggregators? Or how might we support new technology experimentation by local knowledge aggregators?

Share inspiring stories

Design Kit - IDEO.org



Share Inspiring Stories

Once you've had a chance to Download Your Learnings it's time to make sense of them. One way is to share the best of what you heard with your teammates.

Over the course of the Inspiration phase, you've heard stories or had experiences that stuck with you. Most likely, they won't be the ultimate solutions to your design challenge, but chances are they'll resonate with your team as well. At IDEO.org, we Share Inspiring Stories with our teammates so that they become part of our collective consciousness. The goal is to build a repository of stories for your team to draw from, tell, and retell. Capturing those powerful anecdotes and building them into the very narrative of your team's work helps everyone down the line.

STEPS

TIME

30-60 minutes

DIFFICULTY

Moderate

WHAT YOU'LL NEED

Pens, Post-its, a large sheet of paper, tape

PARTICIPANTS

Design team

- 01** | Affix a large piece of paper to the wall to capture all the team's Post-it notes and ideas from the story in one place.
- 02** | Tell the most compelling stories from the field to your teammates. Try to be both specific (talking about what actually happened) and descriptive (using physical senses to give texture to the description). Report on who, what, when, where, why, and how. And then invite each of your teammates to share their own inspiring stories.
- 03** | As you listen to your teammates' stories, write down notes and observations on Post-its. Use concise and complete sentences that everyone on your team can easily understand. Capture quotes, the person's life history, household details, income, aspirations, barriers, and any other observations.
- 04** | Write large enough so that everyone can read your notes. Then put all the Post-its up on the wall, organizing them into separate categories for each person that your team interviewed and each place that your team visited.
- 05** | At the end of story sharing, you'll have many sheets lined up on the wall with hundreds of Post-it notes. Consider this shared information as a group and start to own the most compelling stories you heard.

Write a Brief

Design Thinking for Educators



0-2 Create a Project Plan

GETTING STARTED

Write a Brief

Write up a short "brief" that clarifies the challenge you'd like to address. Write it as if you were handing it to someone else to design with. Capture thoughts on why this is a problem, and what the opportunity for design will be.

BRIEF

A series of horizontal dotted lines for writing a brief.

How Might We!

Capture the design challenge you've decided to work on...

CHALLENGE QUESTION

WHAT KIND OF CHALLENGE IS THIS? (CIRCLE ONE)



CURRICULUM



SPACES



PROCESSES
AND TOOLS



SYSTEMS

TIP

Keep the challenge simple and optimistic. Make it broad enough to allow you to discover areas of unexpected value, and narrow enough to make the topic manageable.

Clarify goal

IDEActivity toolkit



CLARIFY GOAL

It is essential to clarify and precisely define a goal, which will become the new point of reference for the entire process. Therefore, it is important that the required time be spent on this phase, interacting with the group and sharing a common vision on which to build.

It is very important to bring the goal clearly into focus as a goal that is not fully understood cannot be met. The inability to bring the objective into focus probably suggests that the required knowledge has not been achieved.

It is good practice, in clarifying a goal, to make an effort to section it, breaking it down into more accessible portions that may be grasped fully.

Tools:

- *Mind Maps*
- *Goal Orientation*
- *Strategic Disaster*
- *Boundary*
- *5W&H*



IDEActivity toolkit



Remember!

In focusing on the goal, it can be helpful to posit engaging multiple-answer questions such as “How can we...” and “What would happen if...”, or to constantly ask “Why”, creating a chain of thought leading to a simplified framework of the issue, in which the main objective is in clear focus (“Why, why, why” technique).

A good goal should be expressed in one or two sentences at most. It is important to rewrite the phrase describing the objective again and again, until its intended sense and potential are fully recognized by the entire team.

The way in which a goal is defined is not obvious, and does not entail a direct answer. The goal is structured loosely, it should allow enough margin for the identification of secondary aspects and unexpected values, and at the same time, circumscribe the scope enough to make it manageable.

It is important to write down thoughts and considerations on the challenge that is being outlined, setting off from a broad perspective and gradually getting into more and more detail. It is also effective to keep visual memorandums (old sketches, photographs..) as reminders of the mental connections made throughout the evolution of the “clarify goal” process.

Have fun! Even when things get serious, it is important to always remember to laugh and celebrate results both big and small. Each small step forward, is still a step forward!



How To's

The Delft Design Guide

How To's

What Are How To's?

'How to's' (see figure 2.20) are problem statements written in the form of "How to..." (How to's are often written as H2 for short). Examples are: How to carry luggage in the airport? How to transport deep-frozen food in a shop? How to supply people with beverages at a festival?

The "How to.." way of phrasing is dynamic and inviting. The idea is to create a wide variety of problem descriptions. In this way different perspectives are briefly shown, and the problem is described from these different points of view. There are rules in force such as 'postpone judgment', 'associate on the ideas of others' and 'strive for quantity rather than quality'. The How to's are open questions that stimulate your creativity almost immediately. The various "how to" questions give a comprehensive overview of the problem that you are working on.

When Can You Use How To's (H2's)?

'How to's' are most helpful at the start of idea generation. With 'How to's' the problem is reformulated in many different ways and ideas come up easily.

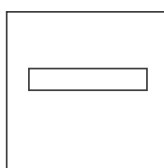
How to Generate How To's (H2's)?

Starting Point

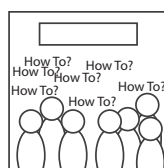
The starting point is the result of the problem analysis stage. Often it is a short description of the problem or a problem statement.

Expected Outcome

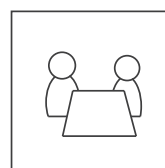
The outcome of the 'How to's' are various problem reformulations in the form of How to's. A benefit of this method is that the problem reformulations reflect different points of view towards the problem.



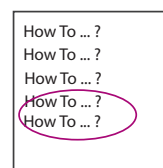
provide discription
of the problem



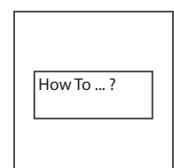
name how to's?



evaluate important
common elements



select some
how to's



formulate one
single concrete
target

Keywords

Problem formulation

Creative

Solution finding

“How might we” questions

Bootcamp Bootleg - Stanford

METHOD “HOW MIGHT WE” QUESTIONS

HOW MIGHT WE...?

WHY create how might we questions

“How might we” (HMW) questions are short questions that launch brainstorm. HMWs fall out of your point-of-view statement or design principles as seeds for your ideation. Create a seed that is broad enough that there are a wide range of solutions but narrow enough that the team has some helpful boundaries. For example, between the too narrow “HMW create a cone to eat ice cream without dripping” and the too broad “HMW redesign dessert” might be the properly scoped “HMW redesign ice cream to be more portable.” It should be noted, the the proper scope of the seed will vary with the project and how much progress you have made in your project work.

HOW to generate how might we questions

Begin with your Point of View (POV) or problem statement. Break that larger challenge up into smaller actionable pieces. Look for aspects of the statement to complete the sentence, “How might we...” It is often helpful to brainstorm the HMW questions before the solutions brainstorm. For example, consider the following POV and resulting HMW statements.

USER	+	NEED	+	INSIGHT
An overworked husband	(needs)	to feel good about recycling		When things pile up he feels behind. And ultimately the big pile on the curb feels more like generating waste than doing good

- How to reduce the size of the recycling pile?
- How to make the husband feel good about a big pile?
- How to reduce the amount of work involved in gathering all the house piles?
- How to eliminate overflowing recycling bins?
- How to make the husband feel ahead of the game?
- How to make the husband feel less overworked?
- How to make recycling feel less like waste?

Create frameworks

Human Centered Design toolkit-IDEO

100 H C D

Create
Identify Patterns
Method: Create Frameworks

STEP
3

METHOD: CREATE FRAMEWORKS

Frameworks allow you to begin putting the specific information from stories into a larger system context.

What is a framework?

A framework is a visual representation of a system. It shows the different elements or actors at play and highlights the relationships between them.

Using your framework

A good framework will help you see the issues and relationships in a clearer and more holistic way. Discuss what the framework implies for constituents, for other actors in the community, and for your organization. Use the framework to develop or build upon key insights. Capture those insights and add them to your growing list.

Facilitator Notes

 **Time:**
1-2 Hours

 **Difficulty:**
★★★★★

Not all design challenges will yield or require frameworks. If the team does not feel that this step is required for your challenge, skip it.

Step 1. Listen for moments in story sharing when the topic fits into a larger system or is linked to another piece of information.

Step 2. When team members start to suggest larger systemic structures or relationships between things, ask them if they can draw what they are saying. Consider the example framework types described here.

Step 3. Allow some time for your team to play with re-drawing their framework several times until they feel it represents what they want to say in a robust way.



GENDER

In many cases, it will make sense to create two different frameworks: one from the perspective of women in the community and one from the male perspective. To understand whether you need to dedicate attention to the different needs of women and men, ask yourself these questions:

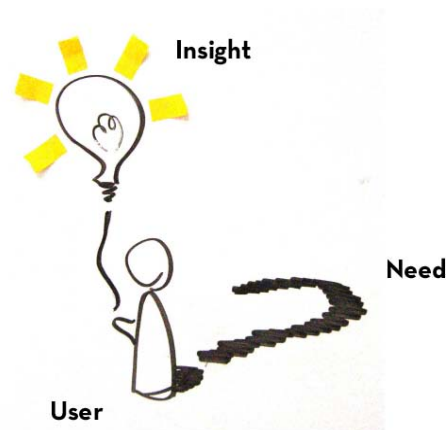
- » How do women's stories differ from those of men?
- » Is gender itself a theme?
- » Do women's stories tell a different story about household activities, income opportunities and barriers, and market relations than the stories obtained from men?

If you answered yes to these questions, think about creating two different frameworks that will yield different sets of opportunity areas for women and men.

Point-of-view Madlib

Bootcamp Bootleg - Stanford

METHOD POINT-OF-VIEW MADLIB



WHY use a POV madlib

A point-of-view (POV) is your reframing of a design challenge into an actionable problem statement that will launch you into generative ideation. A POV Madlib provides a scaffolding to develop your POV. A good POV will allow you to ideate in a directed manner, by creating How-Might-We (HMW) questions based on your POV (see “Facilitating Brainstorms”). Most of all, your POV captures your design vision - your responsibility and opportunity as a designer is to discover and articulate the meaningful challenge.

HOW to use a POV madlib

Use the following madlib to capture and harmonize three elements of a POV: user, need, and insight.

[USER] needs to [USER’S NEED] because [SURPRISING INSIGHT]

Use a whiteboard or scratch paper to try out a number of options, playing with each variable and the combinations of them. The need and insight should flow from your unpacking and synthesis work. Remember, ‘needs’ should be verbs, and the insight typically should not simply be a reason for the need, but rather a synthesized statement that you can leverage in designing a solution. Keep it sexy (it should intrigue people) and hold the tension in your POV.

For example, instead of “A teenage girl needs more nutritious food because vitamins are vital to good health” try “A teenage girl with a bleak outlook needs to feel more socially accepted when eating healthy food, because in her hood a social risk is more dangerous than a health risk.” Note how the latter is an actionable, and potentially generative, problem statement, while the former is little more than a statement of fact, which spurs little excitement or direction to develop solutions.

Identify a design challenge

Human Centered Design toolkit-IDEO

34 **H** **C** **D**

Hear
Identify A
Design Challenge

Facilitator Notes

 **Time:**
1-1.5 Hours

 **Difficulty:**
★★★★★

Step 1: Work with leadership to identify a list of criteria for the challenge. (i.e. Does it need to fit into a certain timeframe? Does it need to have a geographical or topical focus? Does it need to fit into an existing initiative? Does it need to explore new opportunities?)

Step 2: With leadership, the design team, and/or constituents, make a list of the challenges you are facing.

Step 3: Re-frame those challenges from the constituent's point of view and broader context.

Step 4: Vote or select the top two or three challenges based on your criteria.

Step 5: Narrow to one challenge with input from key stakeholders.

Step 6: Write a succinct, one sentence Design Challenge to guide the design team.



IDENTIFY A DESIGN CHALLENGE

The foundation of HCD is a concise Design Challenge. This challenge will guide the questions you will ask in the field research and the opportunities and solutions you will develop later in the process. A Design Challenge is phrased in a human-centered way with a sense of possibility. For example: “Create savings and investment products that are appropriate for people living in rural areas.”



TIP
#1

The Design Challenge can be decided by organizational leadership or can be developed through a team-based approach. In either case, begin by identifying challenges people are facing or springboard off opportunities the organization is interested in exploring. Narrow this list down to one specific design challenge.



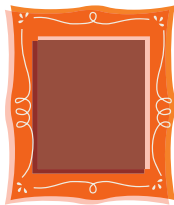
TIP
#2

A good Design Challenge should be:

- » Framed in human terms (rather than technology, product, or service functionality)
- » Broad enough to allow you to discover the areas of unexpected value
- » Narrow enough to make the topic manageable

Frame your Design Challenge

Design Kit - IDEO.org



Frame Your Design Challenge

Properly framing your design challenge is critical to your success. Here's how to do it just right.

Getting the right frame on your design challenge will get you off on the right foot, organize how you think about your solution, and at moments of ambiguity, help clarify where you should push your design. Framing your design challenge is more art than science, but there are a few key things to keep in mind. First, ask yourself: Does my challenge drive toward ultimate impact, allow for a variety of solutions, and take into account context? Dial those in, and then refine it until it's the challenge you're excited to tackle.

STEPS

TIME

90 minutes

DIFFICULTY

Hard

WHAT YOU'LL NEED

Pen, Frame Your Design Challenge worksheet p. 165

PARTICIPANTS

Design team

- 01** Start by taking a first stab at writing your design challenge. It should be short and easy to remember, a single sentence that conveys what you want to do. We often phrase these as questions which set you and your team up to be solution-oriented and to generate lots of ideas along the way.
- 02** Properly framed design challenges drive toward ultimate impact, allow for a variety of solutions, and take into account constraints and context. Now try articulating it again with those factors in mind.
- 03** Another common pitfall when scoping a design challenge is going either too narrow or too broad. A narrowly scoped challenge won't offer enough room to explore creative solutions. And a broadly scoped challenge won't give you any idea where to start.
- 04** Now that you've run your challenge through these filters, do it again. It may seem repetitive, but the right question is key to arriving at a good solution. A quick test we often run on a design challenge is to see if we can come up with five possible solutions in just a few minutes. If so, you're likely on the right track.

Scenario

IDEActivity toolkit



SCENARIO

Imagining and building a scenario helps in considering and discussing the context/product/service, and in evaluating various ideas and hypotheses. Scenarios do not represent reality; they are hypothetical depictions of possible situations/interactions. These essential storyboards may be used both to immediately convey a concept and to facilitate conversations regarding a specific theme/problem.

Constructing a scenario provides suggestions or interpretations of a situation that may occur in the hypothetical future.

Scenarios may refer to a specific context, the features of a new product, the definition of personas, a specific type of business and/or other aspects. They can be created using various tools and different media (images, texts, sketches, videos...)

PROCEDURE

- *Define the story to be told*
- *Identify the main characters or context (people, objects, environment...)*
- *Section the story into key passages*
- *Write a text for each key passage, briefly explaining what happens*
- *Render the key passages graphically (drawings, photos, collages...)*

PARTICIPANTS

3 - 5 people

DURATION

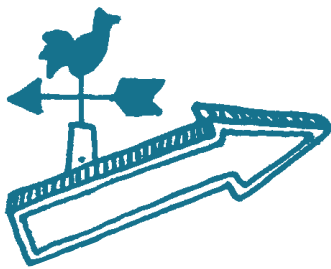
from 20 to 25 min

WHAT NEXT?

- *Personas*
- *Cross*

Scenario

IDEActivity toolkit



Guidelines

1. Discuss the essence of the situation to be depicted with the group, writing it down on a post-it that shall be pasted in the Notes section of the Scenario model provided in the toolkit (see the Mind Map and Personas sections also).
2. Determine who the main characters are, and/or the context. Emphasizing specific details of the context/product/user may be helpful for storytelling.
3. Forming smaller groups of 2/4 people, invent a story about the problem/context identified in step 1. Section the story in 4 key passages, as if storyboarding a film (describing a scene or defining a setting). It is very important to be concise during this phase, making others' interpretation of the story to be conveyed easier.
4. Using the Scenario model, write a short text for each passage of the story. Remember to be as concise as possible, including only information that is truly essential to explain each passage.
5. Render each passage of the story graphically, using the backdrops and figurines provided in the toolkit, or employing other visualization techniques (sketches, photos, collages...)

Storyboard

The Delft Design Guide

What is a Storyboard?

A storyboard (see figure 2.34) is a valuable aid to the designer, because it provides a visual description of the use of a product that people from different backgrounds can 'read' and understand. A storyboard not only helps the product designer to get a grip on user groups, context, product use and timing, but also to communicate about these aspects with all the people involved. With a storyboard the powerful aspects of visualisation are exploited. At a glance the whole setting can be shown: where and when the interaction happens, the actions that take place, how the product is used, and how it behaves, and the lifestyle, motivations and goals of the users. Storyboards allow you to literally point at elements, which helps during the discussion.

Storyboard

However, the visualisation style of the storyboards influences the reactions, e.g. open and sketchy storyboards elicit comments, sleek and detailed presentations can be overwhelming. Storyboards used for analytical purposes, to map situations, problems and feelings, typically have a factual style of visualisation. Storyboards used to conceptualise ideas have a rough visualisation style. Storyboards used to evaluate design ideas are often open, bringing together different points of view. They have a sketchy, incomplete style of visualisation in order to invite reactions. Storyboards intended to transfer or present concepts often look polished.

When Can You Use a Storyboard?

Storyboards can be used throughout the entire design process, from ideas about the interaction with a product to ideas and concepts and also for product concept evaluations (see for example 'Product Usability Evaluation' in section 2.4).

How to Develop a Storyboard?

Starting Point

Used as a tool for developing ideas, a storyboard starts with a first idea about the interaction between product and user.

The Delft Design Guide

Expected Outcome

The outcome of a storyboard is a good conceptual idea about the interaction, as well as visualisations or written descriptions of the interaction. Both visualisations and written descriptions can be used for communication and evaluation purposes.

Possible Procedure

- 1 Start from the following ingredients: ideas, simulations, a user character.
- 2 Choose a story and a message: what do you want the storyboard to express? Limit your story to a clear message (e.g. 12 panels).
- 3 Create sketchy storylines. Don't build the story one panel at a time. Design the time line before detailing. Use variations in panel sizes, white space, frames, captions, for emphasis and expression.
- 4 Create a complete storyboard. Use short captions to complement (not repeat) the images. Don't make all the panels the same: use emphasis.

Tips and Concerns

- Comics and movies are a great source of expressive techniques. Some of these can be applied to product design scenarios and storyboards, whereas others are less suitable. Think about camera position (close-up versus overview), sequence and the style in which you visualise the storyboards.

References and Further Reading

Stappers, P.J. (2004) 'Storyboarding', *In*: Stappers, P.J., (August 2004) *Context and Conceptualisation*.

Jacko, J., et al. (2002) *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications*, New York: Erlbaum and Associates.

Create a visual reminder

Design Thinking for Educators

2-3 Frame Opportunities

INTERPRETATION

Create a Visual Reminder

Frameworks, diagrams, and illustrations are great tools for communicating insights or complex information.

THINGSTOTRY

Map out the network of connections: people, actions, objects, interactions.
Illustrate activity or information flow.
Map the actual/figurative journey that people or things take.

Journey map

Venn diagram

Two-by-two

Relationship map

SKETCH OR CREATE A VISUAL THAT WILL HELP EXPRESS YOUR INSIGHTS.

Collage

Design Kit - IDEO.org

Methods: Inspiration Phase



Collage

Having the people you're designing for make and explain a collage can help you understand their values and thought process.

Making things is a fantastic way to think things through, one that we use at IDEO.org to unlock creativity and push ourselves to new and innovative places. Getting the people you're designing for to make things can help you understand how they think, what they value, and may surface unexpected themes and needs. Collages are an easy, low-fidelity way to push people to make something tangible and then to explain what it means to them.

STEPS

- 01** | When you meet the people you're designing for, make sure you have Collage supplies with you.
- 02** | Give the people you're designing for a prompt for their Collage. Perhaps you ask them to make a Collage that represents taking control of their lives, their dream jobs, or how they think about their families.
- 03** | When they're finished, ask them to describe the Collage, what the various elements represent, and how it speaks to the prompt. Not only will you have a visual record of your research, but you can use the Collage as a springboard to further conversation or to explore new areas in your research.

TIME
30-60 minutes

DIFFICULTY
Easy

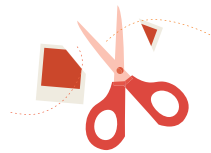
WHAT YOU'LL NEED
Pens, paper, glue, magazines

PARTICIPANTS
Design team, people you're designing for

Design Kit - IDEO.org

The Field Guide to Human-Centered Design

METHOD IN ACTION



Collage

A team at IDEO.org was asked to help create a marketing strategy for a partner that sells health insurance through a mobile money platform in rural Nigeria. The team wanted to co-design the messaging with its audience, but worried that explaining the service could get confusing. Most of the audience had never heard of health insurance, much less mobile money. So the team decided to start with the most basic explanation and let the community help devise a campaign from there. And they did it through an incredibly simple research tool: a Collage.

They asked 25 workshop participants to show them what “community health” looks like. The team picked the term “community health” because it felt like the ultimate goal of the service that they wanted to market. Then they provided images, words, and magazines and told the participants simply to create something.

Going into this process, the team assumed that its audience would want to see medical imagery like doctors, clinics, and medications—images that spoke to the credibility of the service. What surprised them, however, was that community health was far more nuanced in the minds of this group. People were drawn to images of marketplaces, fruits and vegetables, exercise, families, and community events. When the team asked people to explain why they chose these images, they said that health

goes far beyond having access to modern medicine. They told the team that any product promoting better healthcare should consider what makes a healthy lifestyle, not just a trip to the doctor’s office.

This mentality of holistic health applied to the messaging the team provided as well. In particular people were drawn to the phrase, “invest in your health and strengthen your community.” This was because “health insurance” had an entirely different connotation than it often does in the United States, instead of being perceived as coverage for worst-case scenarios, many people thought of it as a community health pool that an individual bought into, which everyone would eventually benefit from over time. This very conception of health insurance ended up at the center of the final marketing strategy. It’s something the team likely wouldn’t have discovered without this Collage exercise.

Here are a few good tricks to keep in mind when you’re having people Collage: Make sure that your prompt is simple, yet evocative. It’s also best if the magazines they’re working with are full of pictures, have some relevance to the topic you looking to learn more about, and are purchased locally. You can also print some key words or phrases if you want to test a particular message.

Collage

The Delft Design Guide

Collage Techniques

What Is a Collage?

A collage is a visual representation made from an assembly of different forms, materials and sources creating a new whole. A collage may include newspaper clippings, ribbons, bits of coloured or hand-made papers, portions of other artwork, photographs, and such, glued (photoshopped) to a solid support or canvas. Making collages is an important visualisation technique in the design process, next to design drawing and three-dimensional modelling (see 'Design Drawing' and 'Three-dimensional Models' in section 2.2).

By means of collages, you make visual representations of the context, user group or product category with the objective of deriving (visual) criteria.

When Can You Use a Collage?

The use of collages serves different purposes in the design process. A collage can aid in determining the colour palette of the product ideas and concepts. Collages are very suitable to present a particular atmosphere or context that you want to capture in the form of the new product ideas and concepts. In addition, collages help to determine and analyse the context in which the product will be used. As a designer you must take into account the context of which the product will be a part, i.e. the users, usage and usage environment. Making a collage helps to identify an existing or a new context.

Visual thinking and visualisation of ideas is inherent in thinking up ideas and solutions in design. Some issues cannot simply be captured in words, and this is where collages come into play. Collages help in structuring, developing, analysing and presenting visual issues that are difficult to express in words. You could think of shape characteristics, colour palette, compositional issues and so on. The overall purpose of using collages in the design process is to bring together visual elements to explore their commonalities.

Deriving Criteria from Collages?

Analysing collages helps determine criteria (design requirements) to which the solution must apply. Criteria of this kind also set a general direction for idea generation. With a collage we can find criteria for such matters as the lifestyle of a target group, the visual appearance of a product, the context of use and the interaction with a product (actions and handling). Other criteria may be how the product functions in its environment, and criteria that concern the category of products with which the new product is comparable. Collages in that way help to generate criteria by which the aesthetic qualities of ideas and solution can be assessed. Therefore, the creation of a collage is a process that is both creative (designing the collage) and analytical (deriving criteria).



Keywords

Visualisation
Mood board
Image board
Form characteristics
Context analysis

Collage

Design Kit - IDEO.org

Choosing Colour, Texture and Materials

After making collages for the context, target group, usage and environment, you can use these images to define a number of characteristic types of colour/texture and materials. By means of analyses of collages you can determine the colours that will play a role. You can determine environment colours, preferred colours, target group and the colours used for existing products. Produce a palette for this by using for example cuttings from magazines/colour guides and/or the computer. The advantage of cuttings from magazines is that you can also obtain an impression of a gloss, material and possible transparency and texture. After gathering these provisional palettes, try to determine which colours will be the main colour for each palette and what the accent colours will be. Determine the relationships of these colours to each other.

Types of Collages?

We distinguish between an abstract collage (see figure 2.8) and a figurative collage. An abstract collage is built from pictures and images that are distorted in such a way that their origins are not visible anymore. Simple techniques are tearing up images, pasting images over one another, applying coloured surfaces with either straight edges or organically ripped edges (see figure 2.8). Usually, abstract collages also contain sections where drawing or painting is applied. Abstract collages miss any pictorial meaning, but only contain meaning on an abstract level in their use of colours and composition. Figurative collages are collages that make use of the



pictorial meaning of the original pictures and images used in the collages. Various types of images are used to create a new image, which itself has a new pictorial meaning.

Image Board and Mood Board

Image Boards and Mood Boards are types of collages that originated from disciplines such as marketing and consumer research. An Image Board and a Mood Board are collages that display the intended user and his/her lifestyle. An Image Board or a Mood Board displays typical lifestyle elements (such as brand preferences, leisure activities and product type preferences) of the users, but also their dreams and aspirations.

How to Make a Collage?

Starting Point

The starting point of making a collage is to determine what the collage is used for. What will be displayed in the collage: the user's lifestyle, the context of interaction, or similar products? Second, it is important to determine how the collage will be used: is the collage instrumental in the design project as a means to generate for example criteria, or will the collage be used to communicate a design vision? (see 'Design Vision' in this section)

Expected Outcome

The outcome of making a collage is a visualisation of an aspect of the problem context, e.g. the lifestyle of users, the context of interaction or the product category. The collage could also be the visualisation

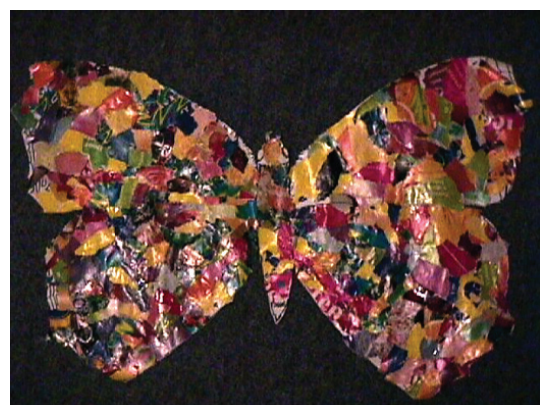


Image telling

IDEActivity toolkit



IMAGE TELLING

The associative ability linked to visual stimuli is fast and efficient, therefore images are the most immediate means of communication. Image telling consists of assembling and creating images (or visual cues) using different materials (photos, newspaper clippings, coloured paper, ribbons...) to describe or depict situations, concepts, desires, emotions etc... This versatile technique is able to describe contexts, interactions, patterns of use and typical users, as well as more intangible concepts that are harder to express in words (suggestions, emotional states...).

Visualisation helps to identify what criteria and requirements are needed to achieve the project's goal.

PROCEDURE

- *Define the message to be communicated or depicted.*
- *Determine and select the materials to use for the collage*
- *Define the structure of the collage and what elements should be conveyed*
- *Make an initial composition, evaluate it, adapt it, and paste its components to a stiff backing.*
- *Use the image as a tool for communication/discussion, and to determine design criteria (moodboard, storyboard, scenarios...)*

POLITECNICO
DI MILANO



PARTICIPANTS

1 - 3 people

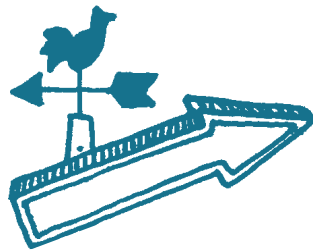
DURATION

from 15 to 60 min
(depending on the
complexity of the mes-
sage to be conveyed).

WHAT NEXT?

• Cross

IDEActivity toolkit



Guidelines

1. Carefully determine what should be communicated or depicted (such as the context, feeling, type of user...).
2. Find and collect useful material for the collage representation of the message to be conveyed /depicted. Use images (newspaper clippings, photos, drawings...) and different materials (such as coloured paper, ribbons, thread, cotton...). It can be useful to begin collecting a large quantity of images and materials without worrying about whether/when they will be assembled/used, considering only the message to be conveyed.
3. Deciding what orientation and sizing the image should have facilitates its creation; define the structure, alignment, axis, foreground and background of the composition with sketches.
4. Make an initial selection of materials, and practice assembling them into trial compositions. Choosing a background image on which to apply details and other images and/or materials might be useful.
5. If the completed composition adequately reflects the features to be depicted, carry on by pasting all the elements onto a stiff backing. It is important to never lose sight of the composition's objective, and of what it should communicate: what matters is not the aesthetic value of the final image, but what it is able to convey!
6. It can be helpful to use different cutting techniques (tearing, piercing...) and materials, to provide the image with a multi-sensory dimension.
7. Once the image is complete, use it as a tool to prompt reflection, defining the design's criteria and requirements.

Problem definition

The Delft Design Guide

Problem Definition

What Is a Problem Definition?

What is a problem? What does a problem definition (see figure 2.13) consist of, and how do goals and objectives fit in? A problem always has to do with dissatisfaction about a certain situation. However, satisfaction is a relative concept, so problems are also of a relative nature. A big problem for one person may not be a problem at all for someone else. An expected situation in the future does not have to be accepted. You can try to do something about it, by acting now. For defining a problem this implies that it is not sufficient to describe the existing state. Therefore, we speak consciously of the situation

that someone is or is not satisfied with. As a result, a description of the situation is a description of a state plus the relevant causal model(s), including the assumed patterns of behaviour of the people and organisations involved. A situation is only a problem if the problem-owner wants to do something about it. This implies that a situation must be conceivable that is more desirable than the present one: the goal situation. The existing situation, however, can also be formulated in such a manner that a problem does arise.

When Can You Use a Problem Definition?

A problem definition is usually set up at the end of the problem analysis phase.

What is the problem?

The problem is that in the opinion of the company Fun-Play BV their target market is too small.

The company wants to expand their target market by developing a toy that can be used on water.

The toy must be able to be moved in and on water.

The product needs to have a driving mechanism and a transportation system that the user eventually could use to get acquainted with the technical aspect of the system. A potential problem is that the product is supposed to attract a target group from 7 - 11 years. Therefore the design should communicate to this target group.

Who has the problem?

The main problem is that the company Fun-Play BV thinks that their target market is too limited. The company wants to expand into the European market. In order to do that, bigger product sales need to be achieved. Therefore the numbers of products need to be increased by creating a new series of toys

What are the goals?

The goal is to design a product that is suitable for kids between 7 - 11 years and addresses a certain play activity of this group. Next to that the product needs to move in or through water with help of a driving mechanism or other transportation system. Furthermore the product needs to be suitable for competition or game element.

What are the avoidable side effects?

Some effects that are created by this product have to be avoided. Next to pollution that the production causes, effects of the user have to be taken into account, such as noise created by the users. Also the space that the product will occupy in public spaces, which in turn can create problems by not leaving enough space for i.e. storage.

Which ways of action are available in the beginning?

There are a number of conditions that need to be agreed on before solving the problem. For this product only the following materials can be used: metal, wood and plastics. The deadline needs to be met in 14 weeks.

Problem definition

The Delft Design Guide



How to Use a Problem Definition?

Starting Point

The starting point of a problem definition is the information gathered in the problem analysis stage. The different aspects surrounding the design problem have been analysed and should be taken into account in the problem definition.

Expected Outcome

A structured description of the design problem, with the goal of creating an explicit statement on the problem and possibly the direction of idea generation. Also, a problem definition clearly written down provides a shared understanding of the problem and its relevant aspects.

Possible Procedure

Answering the following questions will help to create a problem definition:

- 1 What is the problem?
- 2 Who has the problem?
- 3 What are the goals?
- 4 What are the side-effects to be avoided?
- 5 Which actions are admissible?

Tips and Concerns

- When analysing problems there is always a tension between the 'current situation' and the 'desired situation'. By explicitly mentioning these different situations you are able to discuss the relevance of it with other people involved in your project.
- Make a hierarchy of problems; start with a big one and by thinking of causes and effects, divide this problem into smaller ones. Use post-its to make a problem tree.
- A problem can also be reformulated in an opportunity or 'driver'. Doing this will help you to become active and inspired.

References and Further Reading

- Roozenburg, N.F.M. and Eekels, J. (1995) *Product Design: Fundamentals and Methods*, Utrecht: Lemma.
- Roozenburg, N. and Eekels, J. (1998, 2nd ed.) *Product Ontwerpen: Structuur en Methoden*, Utrecht: Lemma.

Introduction

The process

Set up tools and techniques

Explore tools and techniques

- Generative tools and techniques

Future Implementation

Brainstorming rules

Bootcamp Bootleg - Stanford

METHOD BRAINSTORMING



One Conversation at a Time

Go for Quantity

Headline!

Build on the Ideas of Others

Encourage wild ideas

Be Visual

Stay on Topic

**Defer Judgement -
NO Blocking**

WHY brainstorm

Brainstorming is a great way to come up with a lot of ideas that you would not be able to generate by just sitting down with a pen and paper. The intention of brainstorming is to leverage the collective thinking of the group, by engaging with each other, listening, and building on other ideas. Conducting a brainstorm also creates a distinct segment of time when you intentionally turn up the generative part of your brain and turn down the evaluative part. Brainstorming can be used throughout a design process; of course to come up with design solutions, but also any time you are trying to come up with ideas, such as planning where to do empathy work, or thinking about product and services related to your project - as two examples.

HOW to brainstorm

Be intentional about setting aside a period of time when your team will be in "brainstorm mode" - when the sole goal is to come up with as many ideas as possible, and when judgment of those ideas will not come into the discussion. Invest energy into a short period of time, such as 15 or 30 minutes of high engagement. Get in front of a whiteboard or around a table, but take an active posture of standing or sitting upright. Get close together.

Write down clearly what you are brainstorming. Using a How-Might-We (HMW) question is a great way to frame a brainstorm (e.g. HMW give each shopper a personal checkout experience?). (See more on the "How Might We" Questions" method card.)

There are at least two ways to capture the ideas of a brainstorming:

1. Scribe: the scribe legibly and visually captures on the board ideas that team members call out. It is very important to capture every idea, regardless of your own feelings about each idea.
2. All-in: Each person will write down each of his or her ideas as they come, and **verbally share it** with the group. It is great to do this with post-it notes, so you can write your idea and then stick it on the board.

Follow and (nicely) enforce the brainstorming rules - they are intended to increase your creative output.

Generate

IDEActivity toolkit



*Divergence and convergence
are what make ideas and visions
possible.*

The goal of this phase is to generate innovative ideas pertaining to the theme identified during EXPLORE. Conceptual design effectively begins once the problems have been analyzed, and the opportunities defined.

The idea generation phase usually begins with creative sessions conducted by the team with regard to the theme to be investigated. This activity is carried out with support from different tools, used to stimulate creativity and generate suitable solutions consistent with the context and the goals to be achieved.

The tools used during this phase are aimed at:

- * generating numerous ideas
- * visualizing ideas
- * selecting ideas



SET UP

Before you begin:
Before a creative session is conducted, a clear challenge and goal must be established by the team. The challenge should be clear and concise, and the goal should be specific and measurable. The session may be facilitated by an individual facilitator or by the team. It is important to create a safe and supportive environment for all participants, and to ensure that the session is focused on the challenge and goal.

Tools:
Creative Session Plan (CSPlan)
Elicitation Card
Creative Box

- SET UP**
- Creative Session Plan (CSPlan)
 - Elicitation Card
 - Creative Box

IDEA

Before you begin:
The goal of this phase is to generate innovative ideas pertaining to the theme identified during EXPLORE. Conceptual design effectively begins once the problems have been analyzed, and the opportunities defined. The session may be facilitated by an individual facilitator or by the team. It is important to create a safe and supportive environment for all participants, and to ensure that the session is focused on the challenge and goal.

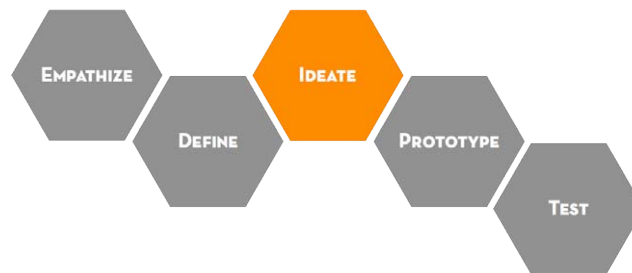
Tools:
Killer Sentences
Brainstorming
Photo Boost
Provocation
Brain Sketching
Cluster & Dots

- IDEA**
- Killer Sentences
 - Brainstorming
 - Photo Boost
 - Provocation
 - Brain Sketching
 - Cluster & Dots

Ideate

Bootcamp Bootleg - Stanford

MODE IDEATE



WHAT is the ideate mode

Ideate is the mode during your design process in which you focus on idea generation. Mentally it represents a process of “going wide” in terms of concepts and outcomes—it is a mode of “flaring” rather than “focus.” The goal of ideation is to explore a wide solution space – both a large quantity of ideas and a diversity among those ideas. From this vast depository of ideas you can build prototypes to test with users.

WHY ideate

You ideate in order to transition from identifying problems into exploring solutions for your users. Various forms of ideation are leveraged to:

- Step beyond obvious solutions and thus increase the innovation potential of your solution set
- Harness the collective perspectives and strengths of your teams
- Uncover unexpected areas of exploration
- Create fluency (volume) and flexibility (variety) in your innovation options
- Get obvious solutions out of your heads, and drive your team beyond them

Regardless of what ideation method you use, the fundamental principle of ideation is to be cognizant of when you and your team are generating ideas and when you are evaluating ideas – and mix the two only intentionally.

Ideation

Design Kit - IDEO.org



IDEATION

In the Ideation phase you'll share what you've learned with your team, make sense of a vast amount of data, and identify opportunities for design. You'll generate lots of ideas, some of which you'll keep, and others which you'll discard. You'll get tangible by building rough prototypes of your ideas, then you'll share them with the people from whom you've learned and get their feedback. You'll keep iterating, refining, and building until you're ready to get your solution out into the world.

THIS PHASE WILL HELP YOU ANSWER

How do I make sense of what I've learned?

How do I turn my learnings into an opportunity for design?

How do I make a prototype?

How do I know my idea is working?

Idea

IDEActivity toolkit



IDEA

Enough research: it's time for action!

So far the foundation for good design has been established; now it is time to generate ideas. Creative sessions provide the opportunity to create, imagine, and freely generate ideas, setting off from the established foundation. The goal is to generate many new solutions for the problem to be solved or the objective to be achieved. This activity has a twofold value, aiding the team both in generating ideas and in identifying which are most interesting and hold the most potential. Using specific tools, the ideas generated during the session are captured, clustered, selected and perfected. The participating team is pivotal in the session's positive outcome. Teams with experts in multiple fields have a much higher potential for generating ideas that encapsulate many different perspectives. During co-design sessions, involving users, experts in the field and/or the client, according to the project's objectives, is both possible and highly effective.

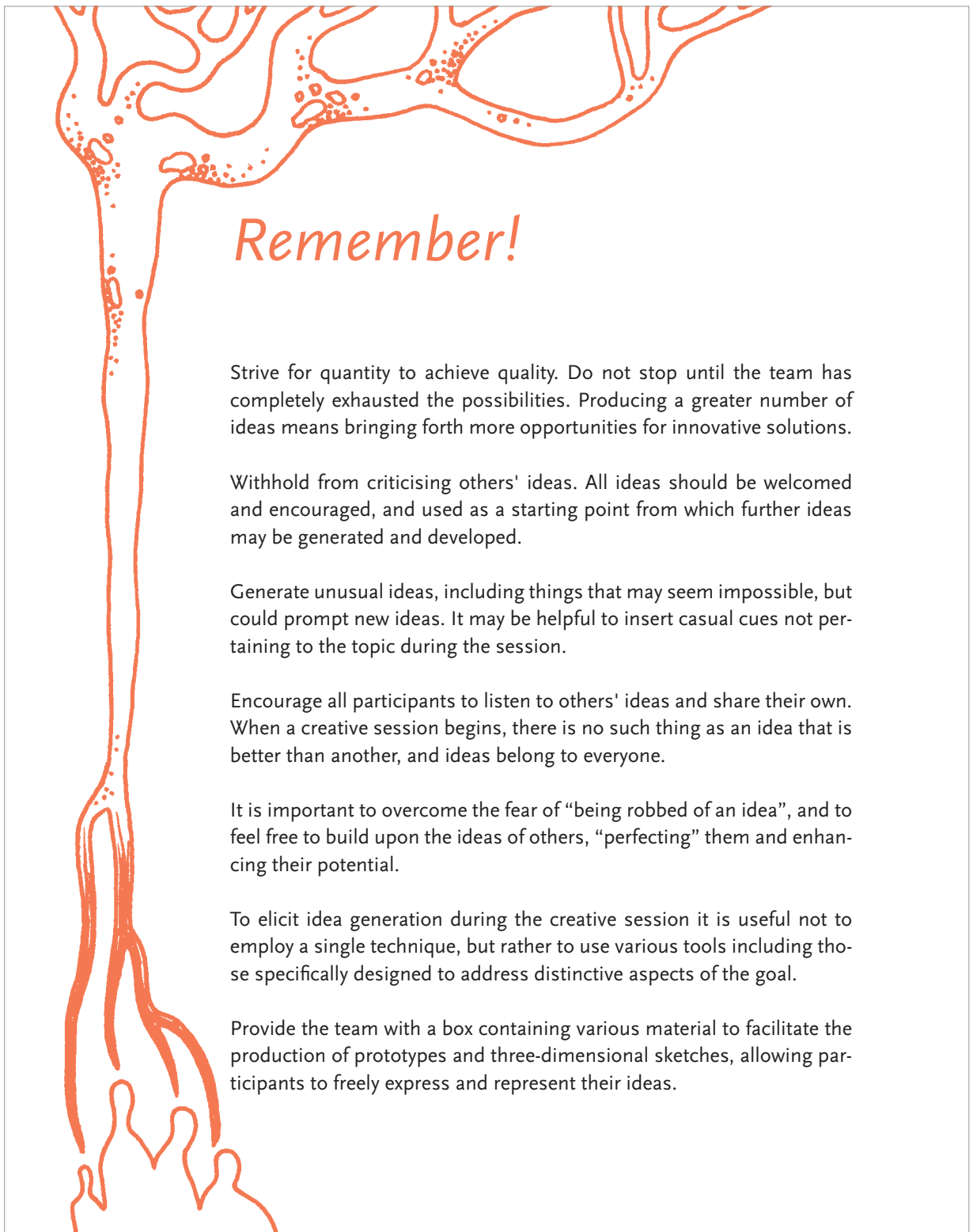
Enjoy yourselves! Having fun is essential in generating ideas!

Tools:

- *Killer Sentences*
- *Brainstorming*
- *Photo Boost*
- *Provocation*
- *Brain Sketching*
- *Cluster & Dots*

POLITECNICO
DI MILANO





Remember!

Strive for quantity to achieve quality. Do not stop until the team has completely exhausted the possibilities. Producing a greater number of ideas means bringing forth more opportunities for innovative solutions.

Withhold from criticising others' ideas. All ideas should be welcomed and encouraged, and used as a starting point from which further ideas may be generated and developed.

Generate unusual ideas, including things that may seem impossible, but could prompt new ideas. It may be helpful to insert casual cues not pertaining to the topic during the session.

Encourage all participants to listen to others' ideas and share their own. When a creative session begins, there is no such thing as an idea that is better than another, and ideas belong to everyone.

It is important to overcome the fear of “being robbed of an idea”, and to feel free to build upon the ideas of others, “perfecting” them and enhancing their potential.

To elicit idea generation during the creative session it is useful not to employ a single technique, but rather to use various tools including those specifically designed to address distinctive aspects of the goal.

Provide the team with a box containing various material to facilitate the production of prototypes and three-dimensional sketches, allowing participants to freely express and represent their ideas.

Create: goals

Human Centered Design toolkit-IDEO

H C D 79



CREATE: GOALS

To move from research to real-world solutions, you will go through a process of synthesis and interpretation. This requires a mode of narrowing and culling information and translating insights about the reality of today into a set of opportunities for the future. This is the most abstract part of the process, when the concrete needs of individuals are transformed into high-level insights about the larger population and system frameworks that the team creates.

With defined opportunities, the team will shift into a generative mindset to brainstorm hundreds of solutions and rapidly make a few of them tangible through prototyping. During this phase, solutions are created with only the customer Desirability filter in mind.

Goals of the Create Phase are:

- » **MAKING SENSE OF DATA**
- » **IDENTIFYING PATTERNS**
- » **DEFINING OPPORTUNITIES**
- » **CREATING SOLUTIONS**

Develop the approach

Human Centered Design toolkit-IDEO

84 (H) (C) (D)

Create
Develop the Approach

STEP 1

DEVELOP THE APPROACH

Creation is about developing deeper understanding and translating that understanding into new innovations. There are many ways to do this, but the two most common are participatory approaches and empathic approaches. Use one or both of these approaches, develop your own, or draw upon different techniques when appropriate.

Facilitator Notes

 **Time:**
Days-Weeks.

 **Difficulty:**
★★★★☆

Step 1. Identify constituents who would be good design team members. The criteria will vary from place to place and from challenge to challenge. For example, do you need people who are successful, respected, and/or politically powerful? Or would it be more valuable to have people who are typical community members? Or perhaps a mix of the two.

Step 2. Schedule a co-design session or series of sessions that works for everyone, and explain the process and goals of the session in advance.

Step 3. Conduct co-design sessions with attentions to the needs, goals, and priorities of the community.

METHOD: PARTICIPATORY CO-DESIGN

Having the team co-design solutions with people from the community and local value chain actors can be a great way to leverage local knowledge. It can also lead to innovations that may be better adapted to the context and be more likely to be adopted, since local people have invested resources in their creation.

Consider using participatory co-design when:

- » you need a lot of local expertise and knowledge
- » solutions from the “outside” will not be easily adopted
- » the politics of a community require it



Facilitate a co-design workshop. Bring 8-20 people from the community together to design solutions to a challenge. Introduce the challenge by telling a few stories of problems that led to the design challenge. Then generalize those stories to How Might We? statements. Ask people to add their own stories or How Might We? questions. Brainstorm solutions with the participants and make sure you have the appropriate materials on hand to prototype.



...
TRY
#2

Co-design over a longer period of time through an in-context immersion. By living with a family over a few days or weeks, you will have the opportunity to ask people to informally identify problems and work together with them in their home, farm, or community. This approach is also very good for spotting new problems and developing solutions to those problems in the moment they happen.



...
TRY
#3

Find local experts and best practices. Ask different community members about the people who are considered to be successful. Schedule time with these people and leverage their knowledge to develop solutions together with them.



GENDER

Make sure to include women in the design team and female community members in the co-design. If living with a family, spend time equally with the husband, wife, extended family, and even the children. When hosting a co-design session, think about whether to have mixed-gender groups, or to have separate groups of men and women. When looking for local experts and best practices, ask who is considered an expert of both men and women, as well as less powerful groups.

Co-creation workshop

Design Thinking book - MJV

CO-CREATION WORKSHOP

WHAT IS IT?

It is a meeting organized in the form of a series of group activities aimed at stimulating creativity and collaboration, fostering the creation of innovative solutions. Usually the people invited to take part have a direct or indirect involvement with the solutions being developed. For instance: the end user, the company staff members requesting the project, and the team that acts as a facilitator of the dynamic.

WHEN TO USE IT?

When there is a large amount of data that can best be dealt with by an extended team, or when it is necessary to add knowledge from different specialists involved in a project. It is very useful for moments of gridlock when new insights about ideas are needed. It can also be used to validate the ideas of a team that is not necessarily involved in the project on a day-to-day basis, but can contribute significantly to its progress on that particular occasion.

HOW TO APPLY IT?

In a creative work session where participants are invited to interact by generating ideas collaboratively. It seeks to develop dynamic activities of short duration for small groups, interspersed with presentations of the ideas generated and snack breaks. Generally, sessions are started with a simple and fast task, not necessarily related to the project, whose goal is to help break the ice and dispel shyness among participants, who are often meeting for the first time. Since each project has its own intrinsic nature and particular needs, it is up to the organizers to think of stimulating activities that will help to expedite collaboration.

Co-creation refers to any act of collective creativity (shared by two or more people).

Creativity: All people are creative. Yet this gift is generally not cultivated in everyday life, with the result that many people do not consider themselves creative at all. People generally have an innate source of creativity, especially in connection with their hobbies, work and children. When properly sensitized, everyone can help develop innovative solutions!

Brainstorming

IDEActivity toolkit



BRAIN- STORMING

Brainstorming (literally a storm of ideas) is a highly efficient technique for eliciting the generation of a great number of ideas within a short time span. The main principle of brainstorming is “suspended judgement” ; indeed, the creative solutions arising from brainstorming should not initially consider an idea's viability or possible implications.

It is important not to concentrate on the quality of each idea, but to strive for quantity. Every idea is potentially a good idea, and must be recorded and evaluated, selecting suitable criteria for judgement, at a later stage.

This technique requires a cooperative environment in which freewheel thought associations are encouraged.

PROCEDURE

- *Present the initial topic and explain the objective or problem to be solved*
- *Make sure participants have acquired the information correctly*
- *Explain the brainstorming rules, and stress the importance of following them*
- *Collect and take note of any idea arising, encouraging crazy ideas and striving for quantity more than for quality*
- *Group ideas into clusters, highlighting those most interesting for the team*



PARTICIPANTS

3 - 8 people

DURATION

60 min

WHAT NEXT?

• C-Box o Dots



Guidelines

1. A member of the team, or an outside individual, must act as the facilitator. His/her task is to guide the team through the activity, making sure to uphold a good environment, and that all members participate, without wasting energy on topics far from the session's objective.
2. The facilitator opens the session by briefly presenting the challenge at hand. To make sure that everyone has understood the goal, it is helpful to go round the table asking participants to recap the objective in their own words.
3. The rules of brainstorming are then introduced, providing an explanation and the scope of each, and creating the correct setting for the activity. There are four essential rules to brainstorming: avoid criticism and suspend judgment; produce many ideas; welcome freewheel though; combine and improve other people's ideas. Ice-breakers are very effective in establishing a good atmosphere at the beginning of the session.
4. Three essential initial suggestions: get comfortable, manage distractions, and hang everything up on the walls. It is important to be in a different position from the one in which work is usually carried out, and that there be no interruptions. Switch off your phone!!!
5. Provide post-its and a felt-tip pens. Ask that ideas be written individually on a post-it and read out loud before being pasted to the wall. Encourage participants to visualise their ideas. The idea generation phase may be freewheel (participants may speak at any moment), or round the table (going round the table to allow each member of the team to speak).
6. Strive for quantity, not for quality of ideas. Once the production phase is exhausted, group ideas into clusters, evaluating their potential and viability as a team (see C-box&Dots also).



Brainstorm new solutions

Human Centered Design toolkit-IDEO

104 **H** **C** **D**

Create
Brainstorm New Solutions

Facilitator Notes

 **Time:**
45-60 mins.

 **Difficulty:**
★★★★☆

Step 1. Prepare 3-5 “How Might We...?” opportunity statements from those generated previously. Place each statement on a separate wall or board. Give each person post-it notes and a marker.

Step 2. Remind people of the rules of brainstorming. Tell them to be very specific about the ideas they are proposing. Use big markers (not pens) so everyone can see what the idea is. Write only one idea per post-it.

Step 3. Begin by asking the group to generate a list of barriers related to the opportunity statement.

Step 4. Protect all participants by enforcing the Rules of Brainstorming. If ideas slow down, prompt the group to think about one of the barriers listed during the warm-up. Or share a story from the research to spark thinking (i.e. “So what ideas would encourage Shashu to adhere to her medication?”)

Step 5. When the ideas really slow down, switch to a new opportunity area. This might be 15-30 minutes per HMW.

STEP 5

BRAINSTORM NEW SOLUTIONS

Brainstorming gives permission to think expansively and without any organizational, operational, or technological constraints.

Some people think of brainstorms as undisciplined conversation. But conducting a fruitful brainstorm involves a lot of discipline and a bit of preparation.

The practice of generating truly impractical solutions often sparks ideas that are relevant and reasonable. It may require generating 100 ideas (many of which are silly or impossible) in order to come up with those three truly inspirational solutions.



TIP

SEVEN BRAINSTORMING RULES

- » **Defer judgment**
There are no bad ideas at this point. There will be plenty of time to judge ideas later.
- » **Encourage wild ideas**
It's the wild ideas that often create real innovation. It is always easy to bring ideas down to earth later!
- » **Build on the ideas of others**
Think in terms of 'and' instead of 'but.' If you dislike someone's idea, challenge yourself to build on it and make it better.
- » **Stay focused on topic**
You will get better output if everyone is disciplined.
- » **Be visual**
Try to engage the logical and the creative sides of the brain.
- » **One conversation at a time**
Allow ideas to be heard and built upon.
- » **Go for quantity**
Set a big goal for number of ideas and surpass it! Remember there is no need to make a lengthy case for your idea since no one is judging. Ideas should flow quickly.

Brainstorming

Design Thinking book - MJV

BRAINSTORMING

WHAT IS IT?

Brainstorming is a technique to stimulate the generation of a large number of ideas in a short time. Usually done in groups, it is a creative process driven by a moderator, who is responsible for putting the participants at ease and encouraging creativity without allowing the group to lose its focus.

WHEN TO USE IT?

When a large volume of ideas is required. In the process of Ideation, Brainstorming provides a rich approach to generating ideas about important issues that have emerged during the Immersion and Analysis phases.

HOW TO APPLY IT?

Because it is a technique widely used for a variety of purposes and activities, many meetings are erroneously characterized as "Brainstorming," simply because their final goal is to generate ideas.

However, in order for Brainstorming to be directed and focused on creative solutions for identified opportunities, raw field data and/ Personæ can be used to stimulate the team. Moreover, for a Brainstorming session to be successful, some precepts must be observed:

Quality through quantity

The quality and vigor of the ideas generated are attained through quantity. The greater the amount of ideas generated by the team, the greater the chance of producing an innovative and functional solution.

Refrain from judging ideas

Criticism should not hinder the creative process and the generation of bold ideas. The focus should be on producing and embellishing ideas, postponing evaluation to a later time.

Generate Ideas

Design Thinking for Educators



3-1 Generate Ideas

IDEATION

3-1 *Generate Ideas*

Prepare for Brainstorming

A successful brainstorm session requires planning. The small details matter. Invite a diverse group of people who can stay open-minded and can build on each other's ideas. 6-10 is ideal for a brainstorm. Who will you invite?

NAMES

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Sufficient wall space is necessary to have room for everyone to get up and see each other's ideas, and will leave you with room to post plentiful ideas. Where will you conduct the brainstorm and how will you set-up the space to facilitate a brainstorm?

ROOM SET-UP

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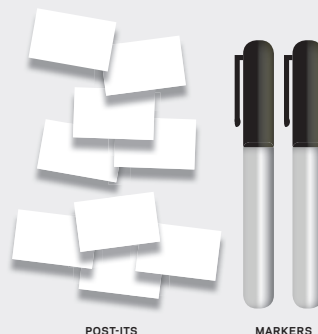
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CHECK LIST

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POST-ITS

MARKERS



SNACKS

(never underestimate the power of sugar in a brainstorm)



PAPER

BRAINSTORM RULES

1. DEFER JUDGEMENT
2. ENCOURAGE WILD IDEAS
3. BUILD ON THE IDEAS OF OTHERS
4. STAY FOCUSED ON TOPIC
5. ONE CONVERSATION AT A TIME
6. BE VISUAL
7. GO FOR QUANTITY

POST THE BRAINSTORM RULES.

Facilitate a brainstorming

Bootcamp Bootleg - Stanford

METHOD

FACILITATE A BRAINSTORM



WHY facilitate a brainstorm

Good facilitation is key to a generative brainstorm. You brainstorm to come up with many, wide-ranging ideas; a good facilitator sets the stage for the team to be successful doing this.

HOW to facilitate brainstorm

ENERGY - As the facilitator it is your task to keep the ideas flowing. Perhaps the most important aspect of a successful brainstorm is the seed question that you are brainstorming about (see the “How Might We” method card for more information). During the brainstorm keep a pulse on the energy of the group. If the group is slowing down or getting stuck, make an adjustment. Create a variation to the “How-might-we?” (HMW) statement to get the group thinking in another direction (prepare some HMW options ahead of time). Or have a few provocative ideas in your back pocket that you can lob in to re-energize the team.

CONSTRAINTS - Add constraints that may spark new ideas. “What if it had to be round?,” “How would superman do it?,” “How would your spouse design it?,” “How would you design it with the technology of 100 years ago?” Additionally you can create process constraints. Try putting a time limit on each how-might-we statement; shoot for 50 ideas in 20 minutes.

SPACE - Be mindful about the space in which you conduct a brainstorm. Make sure that there is plenty of vertical writing area. This allows the group to generate a large number of potential solutions. Strike a balance between having a footprint that is big enough for everyone, but also is not so large that some people start to feel removed. A good rule of thumb is that all members of the group should be able to reach the board in two steps. Also, make sure each person has access to sticky notes and a marker so they can capture their own thoughts and add them to the board if the scribe cannot keep up with the pace. (See more about scribing on the “Brainstorming” method card.)

Create: outputs

Human Centered Design toolkit-IDEO

H C D 81



CREATE: OUTPUTS

Using both left-brain (logical) thinking and right-brain (creative) thinking, this phase will translate your research into a set of strategic directions and tangible solutions.

At the end of the Create phase, the team will have generated the following:

- » **OPPORTUNITIES**
- » **SOLUTIONS**
- » **PROTOTYPES**

Decision and selection

The Delft Design Guide

2.3 Decision and Selection

Design is a process of diverging and converging. The design of a product grows from a product idea via solution principles, concepts and preliminary designs to a detailed definitive design. Design is also a process of working from a large number of ideas to a single detailed design. Designing without intuitive decisions is inconceivable. But for new, complex or unknown decision problems, intuitive decision-making is not always successful. Decision methods aim to help people in making a decision.

In decision methods, you compare alternatives on predefined criteria. You look at how well an alternative performs 'on the criteria' and assign a value to this performance. By bringing together the totality of the values of each of the criteria, you calculate an overall score of the alternative. Calculating the overall scores of each of the alternatives and comparing the alternatives facilitates a decision-making process. This is what decision methods are about.

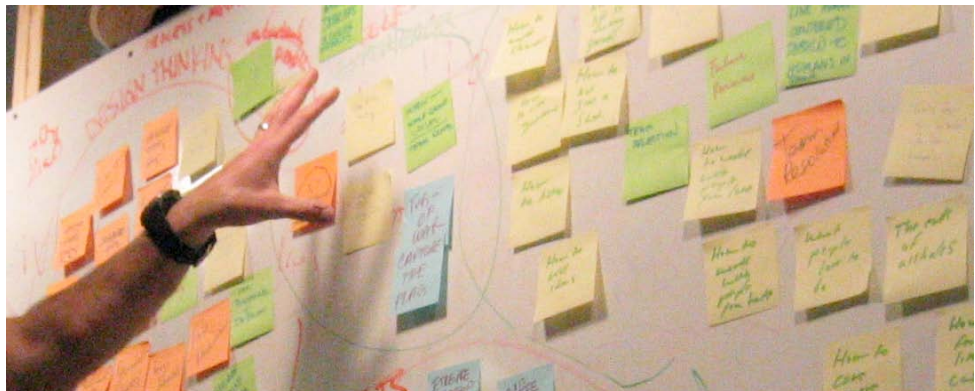
The manner in which the overall score of an alternative is calculated is called the value function, or decision rule. However, these functions and rules are full of fallacies and pitfalls. Therefore, in using a certain method, you should really see whether the specific decision problem does indeed answer those assumptions, for only then does it make sense to use this method. Decision methods do not guarantee a sound answer! They are mere aids in the process of coming to a sound and well-considered decision.

The decision-maker should always reflect on the verdicts/decisions reached, bearing in mind the initially stated goals and aims of the projects.

Selection

Bootcamp Bootleg - Stanford

METHOD SELECTION



WHY brainstorm selection is important

Your brainstorm should generate many, wide-ranging ideas. Now harvest that brainstorm, so those ideas don't just sit there on the board. Harvesting is straight forward for some brainstorms (pick a couple of ideas), but when ideating design solutions give some thought to how you select ideas. Carry forward a range of those ideas, so you preserve the breadth of solutions and don't settle only for the safe choice.

HOW to select

In the selection process, don't narrow too fast. Don't immediately worry about feasibility. Hang on to the ideas about which the group is excited, amused, or intrigued. An idea that is not plausible may still have an aspect within it that is very useful and meaningful.

Different selection techniques can be used, including these three:

1. Post-it voting - each team member gets three votes and marks three ideas that he or she is attracted to. Independent voting allows all team members to have a voice.
2. The four categories method - the method encourages you to hang onto those crazy but meaningful ideas. Elect one or two ideas for each of these four categories: the rational choice, the most likely to delight, the darling, and the long shot.
3. Bingo selection method - like the four categories method, this is designed to help preserve innovation potential. Choose ideas that inspire you to build in different form factors: a physical prototype, a digital prototype, and an experience prototype.

Carry forward multiple ideas into prototyping. If an idea is so far out there that it seems pointless to test, ask yourselves what about that solution was attractive, and then test that aspect or integrate it into a new solution.

C-Box

The Delft Design Guide

What Is a C-Box?

We use a C-Box to generate an overview from a multitude of early ideas. The C-Box is a 2 x 2 Matrix. Two axes are determined that represent criteria according to which the ideas are evaluated. In a C-Box usually the criteria 'innovativeness' (for the users) and 'feasibility' are used. A C-Box has four quadrants based on these axes. You are able to judge quickly whether ideas are immediately feasible or not, and whether they are highly innovative or not. A C-box is commonly used in a brainstorm workshop in order to judge the numerous ideas that are generated in such a workshop. This method also works effectively when you are eager to drop highly innovative ideas. This method could also be seen as a first cluster activity of early ideas. However, the clusters are predetermined by the axes you choose. It is possible to vary the meaning of the axes, for example 'attractiveness' and 'functionality'.

When Can You Use a C-Box?

A C-Box is commonly used in early idea generation, in case of a surplus of early ideas (for example 40+ ideas) generated in a brainstorm session.

How to Use a C-Box?

Starting Point

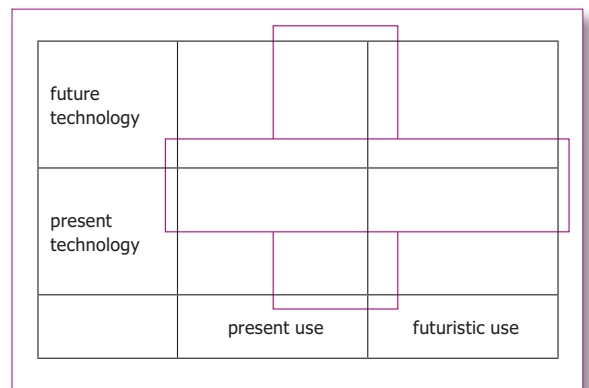
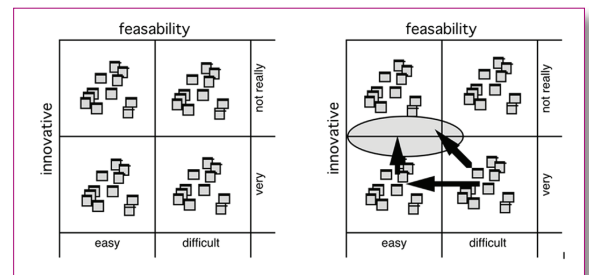
The starting points of a C-Box is a multitude of early ideas (40-60 ideas).

Expected Outcome

The outcome of a C-Box is an overview of the early ideas, clustered in four groups based on criteria set to the axes of the C-Box. Effectively, you have created a first rough distinction between ideas in four groups.

Possible Procedure

- 1 Create two axes (innovativeness and feasibility) on a large paper and construct the 2 x 2 C-Box with those two axes, for example using Scotch tape on a wall surface.
functionality: one end is the familiar, the other end represents highly innovative.
feasibility: one end is not feasible, the other end represents immediately feasible.
- 2 Make sure all ideas are written down, or drawn on a small piece of paper, for example on a post-it or an A5/A4-size paper.

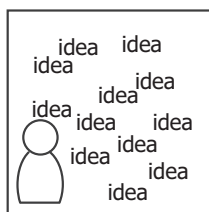


Keywords

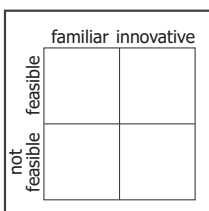
Clustering
Evaluation
Intuitive
Brainstorm
Idea selection

C-Box

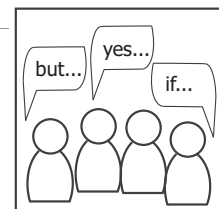
The Delft Design Guide



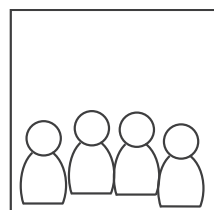
40-60 early ideas



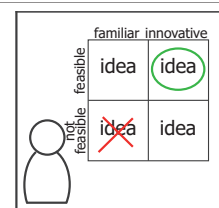
make
2 x 2 matrix



discuss and
review
ideas



place the ideas
in one of the
four quadrants



select promising
ideas and drop
bad ones

3 With a group, review and discuss the ideas, and place the ideas in one of the four quadrants.

4 Make sure that ideas in one quadrant are situated closely to the criteria they meet best.

Once all ideas are placed in the C-Box, a first overview is created, and following steps can be made. These steps consist of working out the most promising ideas and dropping the bad ideas (not innovative and not feasible).

References and Further Reading

Tassoul, M. (2006) *Creative Facilitation: a Delft Approach*, Delft: VSSD.

Facilitate Brainstorming

Design Thinking for Educators



Facilitate Brainstorming

Create, or use some of the suggested warm-up brainstorm questions from the Facilitate Brainstorming method to get people in the right mood. Which questions will you use?

WARM-UP QUESTIONS

.....

.....

.....

.....

.....

.....

Which topic will you focus your brainstorm on?

TOPIC

.....

.....

.....

.....

Which HMW brainstorm questions will you use?

HOW MIGHT WE...

.....

.....

.....

.....

Feeling stuck?

Here are a few other things to try:

Add constraints

Change the magnitude of the solution space, using size, price, time commitments, and count. Ask yourself, "What if... it was larger than this room? smaller than a peanut? took 5 years to implement? took 1 minute? was available for all? available for only a few?"

Use inspiring brands.

Ask yourself, "How would McDonald's, Nike, Apple, Urban Outfitters, or Disney do it?"

Make it time-specific

Ask yourself, "What if it were made for the morning? night?"

Hone in on a target audience

Ask yourself, "What if it were only for tweens? kids? athletes? parents?"

Start with an Idea : Pick a Tangible Product

Design Kit - IDEO.org

Class 1:
Make It Real

04

Start with an Idea: Pick a Tangible Product

30 minutes

Form Teams: To make sure everyone's getting their hands dirty, split up into groups of two or three people for the remainder of this workshop. If your team is only two people to begin with, then we suggest you each choose your own idea to move forward with and build solo. This way you'll still have someone to share your idea with and get feedback. Each smaller team can select a different idea to use throughout the rest of this Class 1 Workshop.

Select a Product Idea: Take some time here in Activity 04 to select a product idea. Remember, you're only voting for what feels like a concrete and tangible solution—maybe something you can hold in your hands. (Hint: look at the **green** Post-its on p. 8 for examples of potential **product** ideas.) We will save the service and space ideas for later in the course, as we'll be building entirely new prototypes in the upcoming weeks of this course.

1. Survey the Ideas

Read through both the ideas your team created in the brainstorm and those provided on p. 8. Think of which ideas you'd like to take forward.

2a. Vote for the Most Innovative Idea

Let people decide in silence first, so you aren't swayed by others on your design team. Draw an **O** in the upper right corner of the idea that you think is most innovative.

2b. Vote for the Most Promising Idea

Draw a **✓** in the upper left corner of the idea that you feel is most likely to succeed.

3. Count the Votes

Is there consensus around a handful of ideas?

4. Discuss With Your Team

If the vote is still split, consider the following questions as a group about each idea:

- Instinctively, how excited is your design team about this idea?
- How innovative and different is this idea from what's already out there?

5. Now Go Ahead and Pick One!



REMEMBER TO MARK IDEAS LIKE THIS



The idea you think
is most innovative



The idea you feel is
most promising

Start with an Idea : Brainstorm

Design Kit - IDEO.org

Class 1:
Make It Real

04

Start with an Idea: Brainstorm

30 minutes

We recommend including a wide variety of ideas that cover all types of design forms—products, services, and environments. Think of the challenges and opportunities for a healthier lifestyle that you notice everyday. Think about your own health, your family's and friends', the health of the people you work or go to school with, and the health of your community. We find that this brainstorm works best when the team is focused on one context (home, work, school, or community) at a time. Make sure to save all of your newly brainstormed ideas, as we'll be referencing these throughout the course—perhaps, take a picture!

Tips for Brainstorming

1. Make Sure You Have Enough Room

Finding sufficient wall space to run your brainstorm and hang your ideas is key to a productive session.

2. Gather Materials

Everyone should have a stack of Post-its and a marker to write with.

3. Write Questions

Write out the "How Might We" (HMW) question for each context in large lettering across the top of four separate sheets of paper.

4. Review Brainstorming Rules

The Class Leader will lead the brainstorm. This requires lots of energy and a strong knowledge of the brainstorming rules. Make sure to review the rules aloud to the whole group before you start.

**5. Hang the First Question on the Wall—
"How might we improve health AT HOME?"**

Everyone should be able to see it and the Class Leader should read the HMW aloud before you begin.

6. Start the Clock!

Take five minutes per question, one idea per Post-it, and be visual! Hang each idea underneath the written question as your teammates create them.

7. Move on to the Second Question—

"How might we improve health AT WORK?"

After five minutes is up, shift to the second context. Have the team move to the right or the left where there is free space. Leave your ideas on the wall. You'll need to save them for later.

8. Repeat for the Third and Fourth Context

Spending around five minutes per context, move on to the final two ("at school" and "in your community").

9. Save Your Ideas

You and your team should take photos or save backup copies of your brainstormed ideas—you'll want to select from these ideas in future workshops.



REMEMBER THE BRAINSTORMING RULES

1. Defer Judgement
2. Encourage Wild Ideas
3. Build on the Ideas of Others
4. Stay Focused on Topic
5. One Conversation at a Time
6. Be Visual
7. Go for Quantity



Describe your ideas

Design Thinking for Educators

✂🔍💡⚙🔄

3-2 Refine Ideas
IDEATION

Describe Your Idea

Create a concept description for the idea that you would like to prototype and repeat for each idea.

CONCEPT NAME:

SKETCH

HOW DOES IT WORK?
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

WHAT NEEDS OR OPPORTUNITIES DOES THE CONCEPT ADDRESS?
.....
.....
.....
.....
.....

ONE-SENTENCE CONCEPT DESCRIPTION:
.....
.....
.....
.....

WHO DOES IT INVOLVE, BOTH IN BUILDING AND IN USING IT?
.....
.....
.....
.....
.....

WHAT DO YOU HOPE TO LEARN MORE ABOUT THROUGH PROTOTYPING THIS IDEA?
.....
.....
.....
.....

Prototype

Bootcamp Bootleg - Stanford

MODE

PROTOTYPE

```
graph LR; A[EMPATHIZE] --- B[DEFINE]; B --- C[IDEATE]; C --- D[PROTOTYPE]; D --- E[TEST]; style D fill:#f00,stroke:#f00,stroke-width:2px; style A fill:#888,stroke:#888,stroke-width:2px; style B fill:#888,stroke:#888,stroke-width:2px; style C fill:#888,stroke:#888,stroke-width:2px; style E fill:#888,stroke:#888,stroke-width:2px;
```

WHAT is the prototype mode

Prototyping is getting ideas and explorations out of your head and into the physical world. A prototype can be *anything* that takes a physical form - be it a wall of post-it notes, a role-playing activity, a space, an object, an interface, or even a storyboard. The resolution of your prototype should be commensurate with your progress in your project. In early explorations keep your prototypes rough and rapid to allow yourself to learn quickly and investigate a lot of different possibilities.

Prototypes are most successful when people (the design team, the user, and others) can experience and interact with them. What you learn from those interactions can help drive deeper empathy, as well as shape successful solutions.

WHY do we prototype

Traditionally prototyping is thought of as a way to test functionality. But prototyping is used for many reasons, including these (non-mutually-exclusive) categories:

- **Empathy gaining:** Prototyping is a tool to deepen your understanding of the design space and your user, even at a pre-solution phase of your project.
- **Exploration:** Build to think. Develop multiple solution options.
- **Testing:** Create prototypes (and develop the context) to test and refine solutions with users.
- **Inspiration:** Inspire others (teammates, clients, customers, investors) by showing your vision.

Many of the goals of prototyping are shared across all four of the above categories. We prototype to:

- Learn.** If a picture is worth a thousand words, a prototype is worth a thousand pictures.
- Solve disagreements.** Prototyping is a powerful tool that can eliminate ambiguity, assist in ideation, and reduce miscommunication.
- Start a conversation.** A prototype can be a great way to have a different kind of conversation with users.
- Fail quickly and cheaply.** Creating quick and dirty prototypes allows you to test a number of ideas without investing a lot of time and money up front.
- Manage the solution-building process.** Identifying a variable to explore encourages you to break a large problem down into smaller, testable chunks.

:: 4 ::d.

Paper prototyping

Design Thinking book - MJV

PAPER PROTOTYPING

WHAT ARE THEY?

They are representations of graphic interfaces with different levels of fidelity, from hand-drawn wireframes on scraps of paper to schematic representations of cell phone screen apps, to a package for soap with final text and color detailing. A paper prototype can start simply, becoming more complex as it goes through successive iterations with users or the team.

WHEN TO USE THEM?

When it is necessary to evaluate the flow of information and the navigability of a system in order to explore possibilities of publicizing a product, or simply to present an idea to users, the company, or the project team itself. These tests may take place in a variety of contexts, from controlled environments, such as usability labs, to group sessions with end users and potential consumers.

HOW TO APPLY THEM?

As the name implies, the end result of this prototype will be on paper. It can be executed by hand, as nothing more than a rough draft of a solution; or with the aid of a computer, in order to evaluate the details of an interface, product or to give notice of services.

CASE — Using a Paper Prototype for new functionalities and to make a site go viral

When the assignment was to redesign the site of the Cupom Mania contest seeking ways to make the product go viral, we carried field research and a survey of the complaints logged at the site's Customer Service channel, as well as Desk Research.

One of the hypotheses raised during the Immersion phase was that the contest also needed to reach a younger audience. To this end, new functionalities were thought up, necessitating a makeover of the site. The new screens were taken to interviews to see if users accepted them.

Prototype for empathy

Bootcamp Bootleg - Stanford

METHOD PROTOTYPE FOR EMPATHY



WHY prototype for empathy

It is common practice to test prototypes with users to evaluate solutions, but you can also gain empathy through prototyping, exposing different information than simple interviewing and observation might. Of course, whenever you test with a user you should consider both what you can learn about your solution and what you can learn about the person - you can always use more empathetic understanding.

But you can also develop prototypes or create situations specifically designed to gain empathy, without testing a solution at all (or even having a solution in mind). This is sometimes called “active empathy” because you are not an outside observer, you are creating conditions to bring out new information. In the same way a solution prototype helps you gain understanding about your concept, an empathy prototype helps you gain understanding about the design space and people’s mindsets about certain issues.

HOW to prototype for empathy

These empathy prototypes are often best used when you have done some work to understand the design space, and want to dig deeper into a certain area or probe an insight you are developing. Think about what aspect of the challenge you want to learn more about. Then discuss or brainstorm ways you might investigate that subject. You can create prototypes for empathy to test with users or with your design team.

Some ideas:

- Have your user draw something (for example, draw how you think about spending money, or draw how you get to work) and then talk about it afterward.
- Create a game that probes issues you want to explore (for example, you could make a simple card game which forces users to make choices related to your design challenge).
- Simulate an aspect of what users are going through to better understand it yourself (for example, if your users plant seeds while carrying a baby, get a sling and carry ten pounds while planting seeds).

Tinkering

Teacher Maker Camp - Waag Society

TINKERING

We use tinkering as a making method. Sylvia Martinez describes tinkering as a “mindset” involving a playful approach to solving problems through “direct experience, experimentation, and discovery.” In our experience, the “mindset” of organizers and participants, and the way they work together is at least as important as what they do or which machines they use. We complete a design and making process together, during which different outcomes are possible, and the end result is neither good nor bad. Together, we research, make, fail, and try again in the name of learning. Join the quest and make room for spontaneous discoveries on the way.

Tinkering, as a making method, consists of what we call a ‘question - make - test’ process, which means learning (playfully) what a design will look like through making lots of short iterations. Always start with a question or problem, which you then begin working through in your first design. Then, create a prototype to further investigate your question or problem. Afterwards, test and put your prototype into practise to see if this is the answer to your question or the right solution to your problem. Often, the results provide new questions that are the beginning of the next cycle of iterations. Take time to consciously reflect upon what you have learned and what you want to learn more about.

EXPERIMENT & PROTOTYPE

If you want to get people tinkering, you’ll need to get their hands moving with some materials. You want to encourage them to play, experiment, and prototype. A good exercise to get people going (while also illustrating the importance of experimenting and prototyping) is the Marshmallow Challenge.

Think to build: Journey Mapping

Design Kit - IDEO.org

Class 2:
Build to Think

03

Think to Build: Journey Mapping

40 minutes

In this planning activity, you'll get a chance to think through essential elements of your idea before you build. By identifying who your solution is for, defining what outcomes you seek to create, and breaking your idea down into essential moments, you'll be able to focus your prototyping efforts. Read the instructions below, peek at the example on the following page, and then try it yourselves in your small groups using the worksheet on p.9.

1. Capture Your Seed Idea

Take the Post-it you've selected or quickly re-sketch a new one to place at the top of your planning sheet.

2. Briefly Describe Your Idea

Include a one or two sentence description about the essence of your idea. Chances are the details will end up changing quite a bit, so it's good to keep it high-level.

3. Define Who You Are Designing for and What You Want to Learn

With each iteration, there will be many moving pieces. But a well-defined target will help keep you and your team on track.

4. Map the Journey

A Journey Map allows you to identify and design for key moments in the experience of the person you're designing for. This simple framework will help you think through the essential steps in a service or the ideal touchpoints of a customer's interaction with a product or environment.

This doesn't need to be an in-depth, detailed representation—the way you might build out a storyboard—but rather a snapshot of three to five high-level moments. Below, we've called out some common ones to start you off, but key moments vary from concept to concept, so consider making your own. Keep in mind that your Journey Map is subject to change as you test and refine your service prototype. You may learn that one piece isn't working and needs to be removed. Conversely, you may find that you should elevate something that felt more like a detail and include it as a key moment. It helps to use Post-it notes to map your journey so you can refine it as you go.



Find Out

How do they find out about your service?

Sign-up / Buy

What's the experience of buying and/or making the decision to join like?

First Use

What's one valuable key moment of using the service for the first time?

Use Again

What's a key moment when a user returns again?

Share

How can they share satisfaction of your service with others?

5. Select 1-2 Key Moments to Prototype

Once you've sketched out a Journey Map for your concept, pick one or two key moments that you want to focus on first. Concentrate on the core moment at the heart of your concept. What do you think might be **most desirable** to the people you are designing for? Revisit *Determine What to Prototype* in the Class 2 Readings (p. 7) if you need a refresher. Don't worry, you can always explore the other moments later!

Think to build: Journey Mapping

Design Kit - IDEO.org

Class 2:
Build to Think

03

Think to Build: Journey Mapping

40 minutes



Name of Your Idea:

Brief Description:

Who is this for?

What are you trying to learn?

Journey Map:

Think to build: Journey Mapping

Design Kit - IDEO.org

Class 2:
Build to Think

03

Think to Build: Journey Mapping

40 minutes



Name of Your Idea: Health Buddy

Brief Description:

Health Buddy is a service that supports healthy goal setting and tracking. Premium users get access to additional offerings like real-time coaching.

EXAMPLE

Who is this for?



A busy person who wants to integrate healthy habits into his or her life and needs help making and achieving goals.

What are you trying to learn?

- What might help motivate people to engage in healthy behaviors?
- What would make it easy to see the progress they're making toward a goal?
- What encourages people to upgrade?



Find Out

Judy wants to get in shape and be more active, but she doesn't know what to do. She goes to the doctor, and he recommends Health Buddy.

Sign-up

Judy purchases the low-cost app, and it guides her through setting up her account to help personalize her experience.

**First Use:
Set Daily Goals**

When Judy first signs in to her Health Buddy dashboard, she sets up her initial goals to track, including ideal weight, sleep, and social time.

**Use Again:
Live Coaching**

Now that Judy likes the app, she upgrades and unlocks a visit from a local coach to help her meet her bigger goals.

Advocate

Judy has fallen in love with the personalized and personable Health Buddy service and shares "Health Love" notes to her friends to invite them to join.

Make ideas real

Human Centered Design toolkit-IDEO


106 **H** **C** **D**

Create
Make Ideas Real

STEP 6

MAKE IDEAS REAL

Facilitator Notes

 **Time:**
45-60 mins.

 **Difficulty:**
★★★★☆

Step 1. Ask teams to partner in teams of 2-4. Small teams help everyone to have a role.

Step 2. Ask teams to pick one solution from the brainstorming boards. You may choose to offer a range of criteria: two teams working on solutions they're "most passionate about," one group on "most feasible" and one on "furthest out" or "long term".

Step 3. Prompt teams to spend no more than 30-45 minutes making their chosen solution tangible, using one of the prototyping forms described here or creating new ones.

Step 4. Give each team 5 minutes to share their idea back with the larger group to get initial feedback. Encourage teams to include an enactment of the experience of use, even if they have a paper-based prototype. Prompt groups to identify what customer needs their prototype addresses and what key questions they still have.

Prototyping is about building to think. This means creating the solution so that it can be communicated to others and making the idea better. Prototyping allows you to quickly and cheaply make ideas tangible so they can be tested and evaluated by others - before you've had time to fall in love with them.

What is prototyping?

- » **BUILD TO THINK:** Prototypes are disposable tools used throughout the concept development process, both to validate ideas and to help generate more ideas. Prototypes are a powerful form of communication and force us to think in realistic terms about how someone would interact with the concept.
- » **ROUGH, RAPID, RIGHT:** Prototypes are not precious. They should be built as quickly and cheaply as possible.
- » **ANSWERING QUESTIONS:** It is essential to know what question a prototype is being used to answer, for example about desirability, usefulness, usability, viability, or feasibility.

Why prototype?

- » To develop a deeper understanding of what an idea means and to reveal questions the team needs to answer.
- » To create an internal dialogue about how the concept works and external communication about the concept.



Imagine the Value Proposition

For each prototype, answer these questions to start building the value of the idea:

- » Who will benefit from this idea? What is the value to the end customers?
- » Why and how is this idea better than alternative options?
- » How much is this benefit worth to them?
- » How much would they be willing to pay for this benefit?
- » How might this payment be collected?

Make ideas real

Human Centered Design toolkit-IDEO



TIP

COMMON PROTOTYPE FORMS



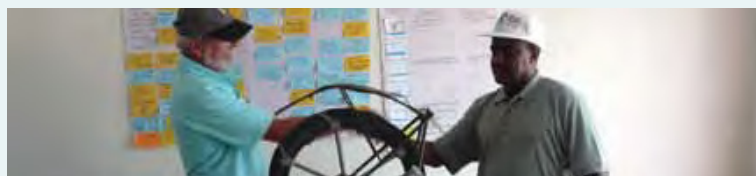
Models:

A physical model of a product, shown above, makes a 2-dimensional idea come alive in 3 dimensions. Using rough materials allows you to quickly mock up low-fidelity prototypes.



Storyboards:

Imagining the complete user experience through a series of images or sketches.



Role-play:

The emotional experience with a product or service is sometimes best expressed by acting it out with team members taking on the role of the constituent or customer.



Diagrams:

Mapping is a great way to express a space, process, or structure. Consider how ideas relate to each other, and how the experience changes over time.

Make it real

Design Kit - IDEO.org

Class 1:
Make It Real

Table of Contents

WEEK 1: MAKE IT REAL

Product Prototyping and Team Feedback

Class Leader's Guide

Before Class 1 Workshop

Activities & Discussions

01 Introductions and Icebreakers—15 mins

02 Warm-Up Exercise—20 mins

03 Prototyping Discussion—20 mins

04 Start with an Idea—30 mins

05 Make It—45 mins

06 Test and Get Feedback—20 mins

07 Iterate—20 mins

08 Debrief on Class 1—10 mins

Warm-Up Exercise: Just Make it!

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Class 1:
Make It Real

02

Warm-Up Exercise: Just Make it!

20 minutes

Sometimes the hardest part of prototyping is moving from an early, emerging idea to that first step of giving it some shape. In this warm-up exercise, you and your teammates will jump right into making very real things.

Make Your Ideal Travel Kit (Rough and Rapid):

Imagine you could travel anywhere. Think for a moment what you might need in your ideal travel kit for this trip. Now make a travel kit just for you and your trip.



STEP 1

Brainstorm Ideas: 5 min

Take a few minutes to jot down or sketch ideas here.



STEP 2

Make It: 10 min

Using some of the materials below, quickly make a rough version of your ideal travel kit!



Colored Paper



Scissors



Markers



Post-it Notes



Rulers



Tape



STEP 3

Reflect: 5 min

Quickly show off your travel kit to each other and share one thought about how it felt to make your idea really quickly. What did you like or dislike? What was challenging about this exercise? What surprised you?

Make it

Design Kit - IDEO.org

Class 1:
Make It Real

05 Make It

45 minutes

Now that you've got something to work with, let's start building your idea! Remember, when first moving from an idea on paper to a physical prototype, it should be pretty rough and scrappy. Use the objects identified below as a starting point to build your initial prototype, and feel free to add some more materials of your own.

Helpful Tools



Colored Paper



Scissors



Markers



Glue



Cardboard
Boxes



Post-it Notes



Ruler



Empty Water Bottles



String



Aluminum Foil



Pipe Cleaners



Tape



Clay

Three-dimensional models

The Delft Design Guide

Three-dimensional Models

What Are Three-dimensional Models?

A three-dimensional model is a physical manifestation of a product idea. It is a hand-built physical model that represents a mass-manufactured product. In the design process, three-dimensional models are used to express, visualise and materialise product ideas and concepts. Three-dimensional models are also called prototypes: the word prototype comes from the Latin words *proto*, meaning original, and *typus*, meaning form or model. Thus, a prototype is an original form, a first-of-its-kind model.

Prototypes offer more than drawings. Prototypes are tangible, three-dimensional forms; they can be picked up, turned over and looked at from different points of view as opposed to drawings. With prototypes, tests and measurements can be carried out to verify whether a particular solution or solution principle works. And prototypes are effective tools to communicate product ideas and concepts. Building prototypes is a form of visualising the final product form. It is a technique just like sketching, making final drawings, photography or filming. In that sense, prototypes are tools that serve the design process. More specifically, prototypes serve the form-giving process in designing.

In the practice of design, prototypes are used as important steps in the product development process. Prototypes serve the industry to test product aspects, change constructions and details, and to reach consensus within the company on the final form.

In mass production, prototypes are also used to test functionality and ergonomics. Changes that need to be made after the production preparation are often expensive and time-consuming. The final prototype thus serves for the preparation and planning of production. The first phase in the production process is called the null series: these first products (still a sort of prototypes) are used to test the production process.

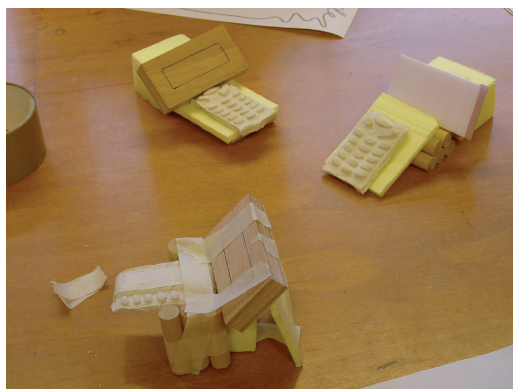
Prototypes are used in the generation of ideas and concepts for three reasons:

- 1 Generating and developing ideas and concepts
- 2 Communicating ideas and concepts in design teams
- 3 Testing and verifying ideas, concepts and solution principles.

Prototypes for Generating and Developing Ideas and Concept

Sketch models (see figure 2.45) are kinds of prototypes that are used frequently in the phase of generating ideas and concepts. Simple materials are used, such as paper, cardboard, foam, wood, adhesives, wire and solder. Sketch models are tools that are used to visualise early ideas and to develop those early ideas into better ideas and concepts.

Often you see an iterative process between sketching, making sketch models, drawing, and making a second generation of sketch models.



Three-dimensional models

The Delft Design Guide

Proof-of-concept prototypes (see figure 2.46) are used to verify whether certain technical principles actually work. Materials such as technical Lego, Meccano or Fisher Techniek (prototype material) can be used. Proof-of-concept prototypes are simplifications; often details are left out, and only rudimentary forms and working principles are built. Proof-of-concept prototypes are also called FUMO's: Functional Models. Based on the moment in the idea generation phase, the level of detail is determined and the choice of materials. In the beginning of idea generation, prototypes are often built of paper, cardboard and foam. At the end of idea generation, prototypes of the concepts are made of foam, wood and metal.

A dummy (mock-up) (see figure 2.47) is a 1:1 scale model of the product idea. A dummy is a prototype that only has the external characteristics of the product idea, and not the technical working principles. It is often built at the end of the idea generation, to visualise and present final concepts. A dummy is also called a VISO: a Visual Model.

A detailed model is used in the concept generation phase to show particular details of the concept. A detailed model is much like a dummy; both are 1:1 scale models with predominantly external characteristics of high quality. A detailed model can also have some limited functionality.

A final model (see figure 2.48) often concludes the concept generation phase. The final model is a prototype that has a high-quality look, built of wood,

metal or plastic, with real buttons and high-quality paint or finishing. The final model might also include some of the technical working principles.

Prototyping to Communicate Ideas and Concept in Design Teams

Prototypes are effective tools for communication purposes. When working in a team, prototypes help in building a shared understanding of the design problem and the solutions (ideas and concepts). Sketch models with increasing levels of detail help the development of product ideas and concepts within the team.

For the communication of ideas to parties outside the design process (for example stakeholders involved), prototypes are also a powerful tool. Often a dummy or a final model is used to present a product idea or product concept. Knowing the audience to whom you are presenting is important, though, in order to present an appropriate prototype built from the right materials and with the right techniques.



Three-dimensional models

The Delft Design Guide

Prototyping to Test and Verify Ideas, Concept and Solution Principles

Prototypes also serve the purpose of testing and verifying ideas, concept or solution principles. (See figure 2.49, also see 'Evaluation of Product Features' in section 2.4).

There are generally three types of tests for which prototypes are used:

1. Testing technical – functional characteristics of a product idea. Often a sketch model is used with some working functionality, or functioning technical principle, based on the goals of the test.
2. Testing form characteristics. Often a detailed model is used for judging user preference.
3. Testing usability characteristics. Often a final, working model is used for testing the intended usability of a product concept.

When Can You Use Three-dimensional Models?

Prototypes can be used throughout the conceptual design process. In the beginning of idea generation, various types of sketch models are used. During idea generation a dummy or detailed models are used, and the concept generation phase is often concluded with a final model.

How to Use Three-dimensional Models?

Starting Point

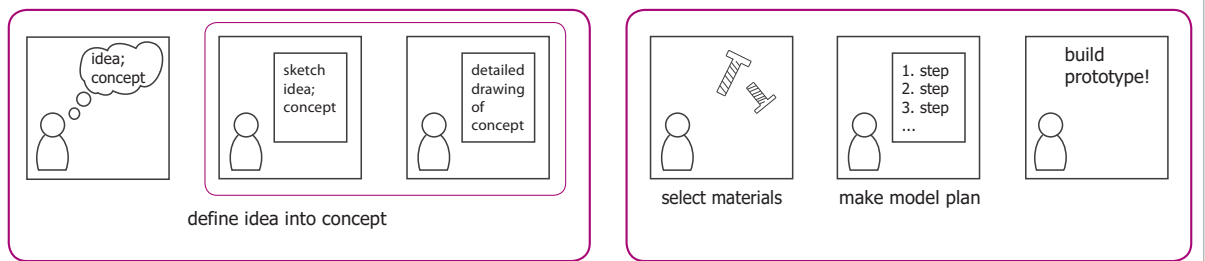
The starting point of building models can be a (mental) sketch of a product idea (sketch model) or detailed drawings and a building plan (final model).

Expected Outcome

The outcome of building models are three-dimensional, tangible models of an idea, concept or solution principle.

Possible Procedure

- 1 Three-dimensional model building starts with some notion of an idea, concept or solution principle.
- 2 Based on the purpose of the model, some level of detail has to be determined prior to collecting materials, devising a plan and building the model. Simple sketch models at the beginning of idea generation only require a simple sketch, while final models (final prototypes) require a detailed plan of how to build the model.
- 3 Collect the appropriate materials, such as paper, cardboard, wood, foam, adhesives, plastics, metals, wire, and paint.
- 4 Devise a plan for building the model. For a simple sketch model, early idea sketches are often enough. Detailed or final prototypes usually require detailed drawing including dimensions.
- 5 Build the prototype (see figure 2.45).



Three-dimensional models

The Delft Design Guide

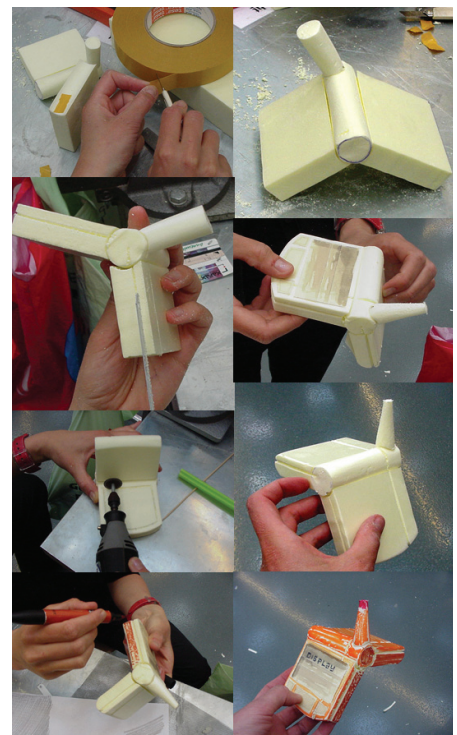
Tips and Tricks

- Look for examples of what different sketch models can look like. Sketch models as simple as paper and glue are often very helpful in the beginning of the idea generation. Try this yourself!
- Many examples can be found of final models, or detailed models.
- Use the expertise of the people working in model workshops.
- Select your tools for model making well

References and Further Reading

Roozenburg, N.F.M. and Eekels, J. (1995) *Product Design: Fundamentals and Methods*, Utrecht: Lemma.

Roozenburg, N. and Eekels, J. (1998, 2nd ed.) *Product Ontwerpen: Structuur en Methoden*, Utrecht: Lemma.



Reflection

Teacher Maker Camp - Waag Society

NOTEBOOKS

There are different ways to make reflection part of your Teacher Maker Camp. Here are some examples of the things that we initiated.

We handed out booklets on the first day. These booklets can be made any way you want, but make sure it looks special and inviting so that people will want to sketch and write in it. Participants can use these booklets not only to document their process and write down interesting websites, but also to reflect on their learning.

QUESTIONS

We asked participants the question: what did you learn today as a teacher, student, and maker? In maker education, the roles of teacher, student, and maker often alternate; so it is important to make a distinction between the three identities in order to rethink and (re)design one's own educational practise. We reminded people to answer the questions for themselves at a set time each day.

DAILY WRAP-UP

Another way to facilitate reflection is to ask groups to present their works each day during a daily wrap up. But, to ensure people don't start elaborating on every step they took, ask them a straightforward question they have to answer (either individually or as a group). Some examples include: what did you learn today; how did you collaborate; come up with three words that describe the day or your project; and so forth. Have a few questions ready at the beginning of your Teacher Maker Camp and decide each day, depending on the moods and stated of minds, which questions you decide to tackle during the wrap up.

You can also decide to present a moment for reflection in the form of a challenge. The Yo-yo Challenge, for instance, helps people reflect on the way they prefer to learn.




Gather feedback

Human Centered Design toolkit-IDEO

108 **H** **C** **D**

Create
Gather Feedback

Facilitator Notes

 **Time:**
1-1.5 Hours

 **Difficulty:**
★★★★☆

Step 1. Ask team members to prepare how to present their solutions to participants. It's not necessary to give behind-the-scenes organizational information to them.

Step 2. Have teams practice presenting solutions to the rest of the group—enactment is especially effective. Invite others to help simplify and clarify the presentation and identify focus questions to be answered in research.

Step 3. Ask teams to standardize a script about the solution so it is delivered consistently at each feedback session. Write down key questions to ask in follow-up.

Step 4. When introducing the feedback session to the customer group, explain you want honest feedback—even if negative—and that the team has spent minimal time prototyping.

STEP 7

GATHER FEEDBACK

After solutions have been generated, it's time to take them back out to participants to gather feedback.



**WATCH
OUT**

Don't invest too much time perfecting the ideas before feedback – the point of re-engaging customers is to change the solutions, not to prove that they are perfect. The best feedback is that which makes you rethink and redesign.

How to solicit feedback

A great way to get honest feedback is to take several executions out to people. When there is only one concept available, people may be reluctant to criticize. However, when allowed to compare and contrast, people tend to speak more honestly.

Whose feedback to solicit

Speaking to new participants in a different region from where you did your research is a way to explore the generalizability of a solution. You may choose to speak to a mix of both new people and to those you have spoken with before.

Try to include all stakeholders who would touch the concept; in addition to the end user, include manufacturers, installers, service providers, distributors, retailers, etc.

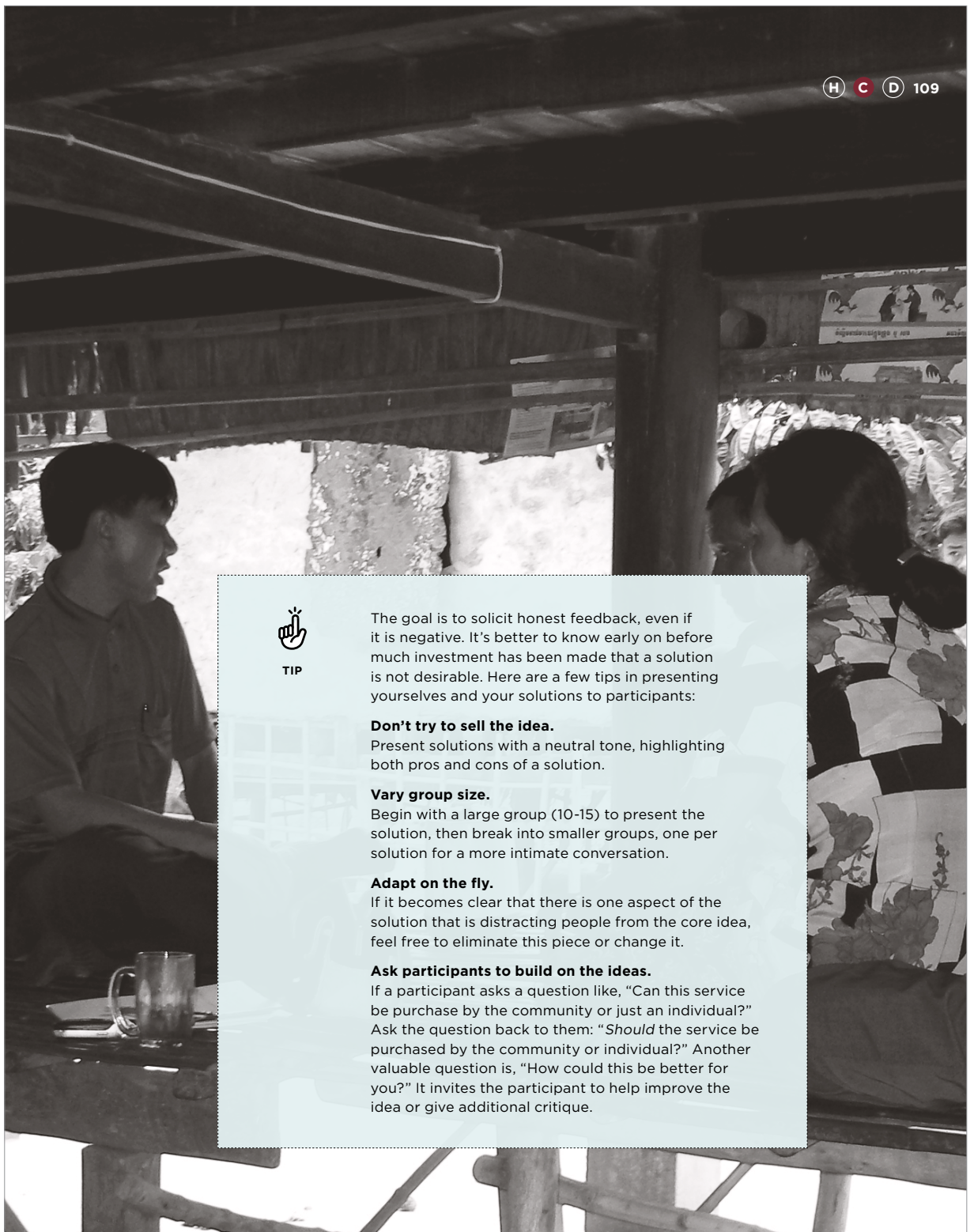
What questions to pursue

For each prototype, identify 3-4 questions you'd like answer about desirability or use case during the feedback session.

Keep careful notes of the feedback, both positive and negative, and the new questions the team needs to answer about the solution.

Gather feedback

Human Centered Design toolkit-IDEO



H C D 109



TIP

The goal is to solicit honest feedback, even if it is negative. It's better to know early on before much investment has been made that a solution is not desirable. Here are a few tips in presenting yourselves and your solutions to participants:

Don't try to sell the idea.

Present solutions with a neutral tone, highlighting both pros and cons of a solution.

Vary group size.

Begin with a large group (10-15) to present the solution, then break into smaller groups, one per solution for a more intimate conversation.

Adapt on the fly.

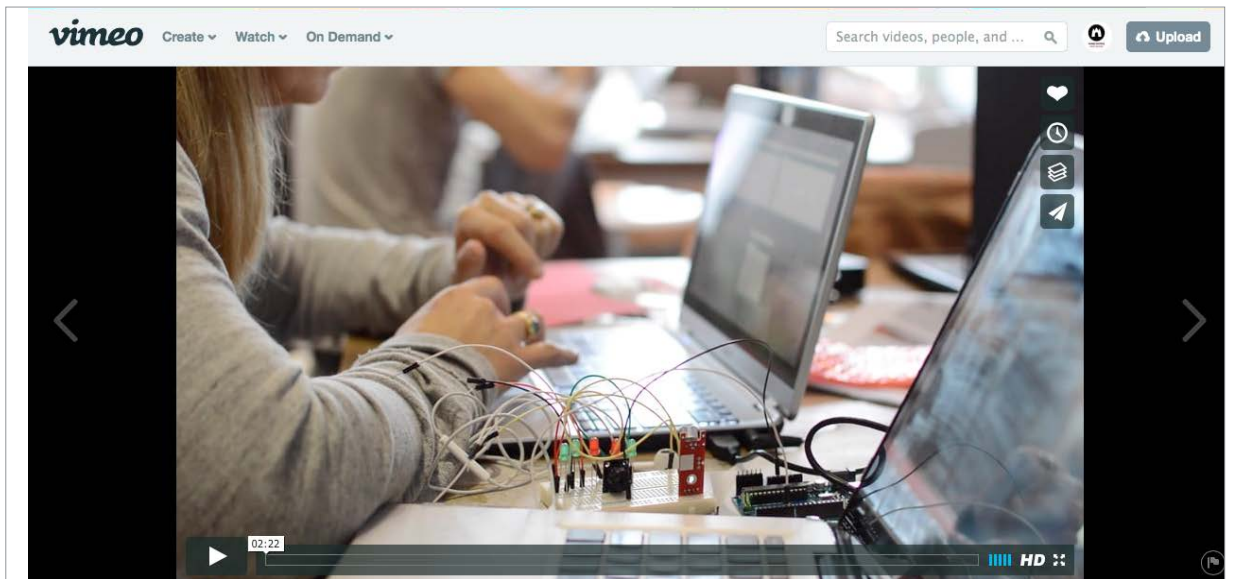
If it becomes clear that there is one aspect of the solution that is distracting people from the core idea, feel free to eliminate this piece or change it.

Ask participants to build on the ideas.

If a participant asks a question like, "Can this service be purchase by the community or just an individual?" Ask the question back to them: "Should the service be purchased by the community or individual?" Another valuable question is, "How could this be better for you?" It invites the participant to help improve the idea or give additional critique.

Documentation

Teacher Maker Camp - Waag Society



WE ALSO MADE
A VIDEO OF OUR
TEACHER MAKER CAMP

**Search for Teacher Maker Camp on Vimeo.com*

DOCUMENT

Make sure to motivate your participants to document the things they have made and learned, so they can share their results with others. This way, they can learn from each other; and not just within their local maker environment, but all over the world. Additionally, they'll end up with a chronicle of memories relating to the ups and downs of their greatest failures and biggest successes.

SHARE

Documentation is easily shared on the Internet. There are a lot of websites (like Instructables, Etsy or Github) that can help you share your projects and provide you with a great platform to make your designs visible in the world. Take a lot of pictures, draw quick sketches, create files, shoot videos, and make screenshots throughout the process. Then, combine these records of your progress in a document, making sure that you format it using a clear organizational structure. For example, start with a quick, two-line introduction to the project—what is it?

VIMEO + FLICKR

Then, provide a list of all materials used and resources accessed. If you have any files a future reader may need, this is also a good place to put them. After that, make a numbered list with all the necessary steps for a successful project. Finish with comments about your experiments, failures, and decision making throughout the process. Finally, publish your documentation on, for instance, a Vimeo channel or Flickr page.

Shooting a video

Bootcamp Bootleg - Stanford

METHOD SHOOTING VIDEO



WHY video

Video is a powerful medium for communicating ideas, insights & stories. Planning ahead, but staying open to possibility will give you the best chance of stumbling on a magical moment. Know what you are trying to do and be aggressive about communicating it in the frame. If it's not in the frame, it doesn't exist.

HOW to shoot video

Tips:

Direct Attention:

1. Know your intention. What are you trying to highlight? How do you want it to feel?
2. Bias toward tight framing.
3. Figure Ground: Get a good contrast between the subject & the background.
4. Be conscious of light sources & shadows on your subject.
5. Follow the rule of thirds, frame off-center.

Plan to Improvise: Know what you want, be flexible about how you get it.

1. Plan Ahead: Storyboard out your idea. Iterate!
2. Get Lucky: Follow your curiosity on the day of your shoot.
3. Overshoot! Get more than you think you need! More stuff gives you more options when editing. Longer takes allow you some wiggle room for transitions.

Audio is Important!!! Remember the 2 rules:

1. Mic close to the subject.
2. Point away from (undesired) noise.

Make Prototypes

Design Thinking for Educators

4-1 Make Prototypes

4-1 Make Prototypes

Take Photos
Since your prototype should be out in the world, take photos of it and place them here.

Place photo here

Place photo here

4-1 Make Prototypes

EXPERIMENTATION

SOME THINGS TO TRY

CREATE SEPARATE SIMPLER PROTOTYPES
"Works like" (how the back end functions), "acts like" (how the "front-end" interaction works), and/or "looks like" (how it looks).

TRY "EXPERIENCE PROTOTYPES"
Have people roleplay or bodystorm using props and prompts.

SHRINK BIG THINGS DOWN
Use scale models and mockups.

GO 2D
Use storyboards or diagrams.

Place photo here

Place photo here

Test and Get Feedback: Team

Design Kit - IDEO.org

Class 1:
Make It Real

06

Test and Get Feedback: Team

20 minutes

Often the first people to give you feedback on your prototype are the people that are around you while you're building. For this activity, you'll share your prototype with the other team(s) in your group to get their feedback. If you don't have another group to share with, consider someone else in your vicinity, or set up a virtual share with other course takers! The tips below will help you get the most useful feedback from your shareout. The worksheet and prompts provided on p. 14 will help you capture feedback.

Invite Honesty and Stay Neutral

Introduce your prototype as a work in progress and make sure to present it in a neutral tone. Avoid being defensive or turning it into a sales pitch. Listen to all feedback with open ears and an open mind.

Capture Feedback Learnings

Note both the positive and constructive comments as you test your prototype. Subtle impressions of a participant's reactions are often most important to remember.

Ask Focused Questions

At times, you may be hearing an overwhelming "love it" or "hate it" reaction, but these don't help you get at the root of what's working (or what's not). Follow up with more pointed questions, such as, "What's most useful about this?", "How much would you pay for it?", "How often would you use it?", or "What would make it this better?" That way you're more likely to get useful feedback that helps you continue to evolve your idea.



Test and Get Feedback: Capture Feedback

Design Kit - IDEO.org

Class 1:
Make It Real

06

Test and Get Feedback: Capture Feedback

20 minutes

What worked?

- What was exciting?
- What did people value the most?
- What resonated with them about the idea?

What didn't work?

- What would you change?
- Were there suggestions for improvement?
- What did you learn that will make it better?

What questions came up?

- What needs further investigation?
- What made you curious?

What new inspiration arose?

- What surprised you?
- What might you try next?

Introduction

The process

Set up tools and techniques

Explore tools and techniques

Generative tools and techniques

- **Future Implementation**

Develop a sustainable revenue model

Human Centered Design toolkit-IDEO

126 **H** **C** **D**

Deliver
Develop a Sustainable
Revenue Model

Facilitator Notes

 **Time:**
30-45 mins.

 **Difficulty:**
★★★★★

Focus on one solution at a time and take the team through the following exercise. Alternatively, the larger team can be split into smaller teams of two or three, with each smaller team focusing on one solution.

Step 1: On a board or flip chart, write "Customer Value." Ask the team to identify how each solution will provide value to the end customer. Write everything down. Ask the team to answer the question: "How much is this worth to the end customer?" Write down the figure on the chart.

Step 2: On a separate board or flip chart, write "Revenue Sources." Ask the team to identify who will pay for the product or service. How much will each actor pay? How will the payments be received? Use the example fee models in the "Try" text box to help.

Continues next page.

STEP 1

DEVELOP A SUSTAINABLE REVENUE MODEL

The long-term success of solutions depends upon the intentional design of a revenue stream that can sustain the offering over time. Let the value provided to the end customer be your entry point as you design the support systems around the solution. For this Viability Assessment, answer the following questions for each solution.



TIP

1. Customer Value Proposition

- » What is the value proposition for the end customer? Refer back to prototypes and customer feedback, highlighting the aspects customers found most important.
- » How much is this worth to the end customer?

2. Revenue Sources

- » Is the solution a product, a service or both?
- » How much do customers pay?
- » How do customers pay: in cash, in kind, in labor, in other?

3. Stakeholder Incentives

- » How does this solution deliver value to each stakeholder involved?
- » What are the stakeholders' incentives to participate? What are challenges or disincentives? How might we adapt the solution to avoid these disincentives?

Competences in design

The Delft Design Guide

Part 3 Competences in Design

3.1
Planning
& Design

3.2
Communicating
& Design

3.3
Reflection
& Design

3.4
Traps, Tricks
and Strategies
& Concept
Development

3.5
Teamwork
& Design

3.6
Finding
Information
& Design

In this part of the Delft Design Guide we present some methods, tips, deliberations and so on, on more generic topics that are of interest while learning and practising design. The topics are not specifically attributed to one particular phase in the design process, but useful and applicable in a more general sense. As for the other parts of this Design Guide, the reader should be aware that this material offered does not cover all the knowledge of these topics but serves as a starting point for further study.

Communication & Design

The Delft Design Guide

3.2 Communication & Design

In product design, communicating the results of a design process is unmistakably a very important part of a designer's work. There is a wide variety of *means* designers use to communicate their design results. It depends on the *purpose* of the communication which means are suitable to apply. For example: when you have to convince a client and you want the client's commitment for a next step in the product development process, you will need other presentation techniques than when discussing a production plan with a production engineer.

How to Communicate Design Results?

The mode of communication depends on your purpose or *objectives* e.g. to *convince*, to *explain*, to *instruct*, to *document* or to *discuss* design results and to whom: the *target group* e.g. the audience. It is also important to know how much *time* you have to prepare and how much time the audience would like to spend. When you communicate your design result, conveying the content of your story is most efficient when paying extra attention to the form and structure of your communication. Consider what main points and minor points you want to make, and in what order.

Communication of design result can have the following forms:

- 1 An **oral presentation**: e.g. using digital text and images projected with a video projector, on a laptop or flatscreen; poster(s) on a wall; 3D models.
- 2 A **written report**: e.g. text and drawings, an executive summary for quick readers, annexes for detailed information.
- 3 **Technical documentation**: e.g. total assembly, mono drawings, 3D renderings.

Elements of successful communication

The most important aspects that should be distinguished and questions that should be answered before working on a means to communicate design results are:

- 1 **Objective**: What is the purpose of the communication? E.g. to convince, to inform, to explain an idea, a concept, a product-user interaction...
In *informative* presentations you present only the facts, often because your audience needs that information to make a decision or form an opinion. In *persuasive* presentations you present evidence to underpin and stress your own opinion. In *instructive* presentations your aim is to increase the audience's skills in a particular field.

2 **Target group**: Who will be the audience and what is the interest of the audience? E.g. a client, engineers, a financial manager, a large group or a single person, culture... The more uniform your audience is, the easier it is to adjust your presentation. If you have a mixed audience, they will have less in common and share a smaller common frame of reference.

3 **Context**: What is the location and how much time and which means are available? E.g. a studio with tables, a congress hall, a chair in a waiting room at the airport, 1 hour, minutes...

4 **Means**: Which means are appropriate? E.g. posters, 3D models, beamer, role-play, movie, sound, collages, design drawings, technical documents, report...

5 **Feasibility**: What can be realised within the time, by the means etc. that are available?

Oral Presentation

Designers often have to do oral design presentations for small groups, e.g. a client (i.e. a team with a project manager, a marketing manager, an R&D employee and an assistant). When listening to oral presentations people have some general preferences:

- **Appreciations**: Clear structure, to-the-point content, a gripping, enthusiastic style, with a sense of humour, 3D objects...
- **Annoyances**: Unclear structure, difficult to hear, bad slides, reading from a written text, lack of time or enthusiasm...

Some guidelines for an oral presentation

Content & Structure:

- 1 Make the objective of the presentation explicitly clear
- 2 Make and use high-quality visual and oral means
- 3 Prepare a good introduction (how to get the attention of the audience?)

Communication & Design

The Delft Design Guide

- 4 Prepare a clear structure of the content
- 5 Prepare a good closing of the presentation (e.g. summary or message...)

Presentation Technique:

- 1 Keep good contact with the audience
- 2 Use good speaking skills (practise!)
- 3 Listen to your voice: the right volume, intonation, articulation, speed
- 4 Use suitable body language (for a big audience use large gestures)
- 5 Show involvement, enthusiasm
- 6 Use the right means at the right place
- 7 Give examples and/or checklists

Written Report

Designers often have to present their work in the form of a document or a report. In the setting of a study, reporting on the process and the progress of the design is very important in order to receive constructive criticism from coaches and teachers. A written report can have the objective of explaining a design (process) or convincing an audience of the value and quality of a design. When explaining the process of design, a chronological order is suitable. When aiming to convince your audience, the structure of a report can be different, e.g. in a logical order.

Some guidelines for writing a report

- 1 Structure: Every report contains an introduction, a body and a conclusion.
- 2 Content: The content of the report serves the purpose. When explaining a design process, you should pay attention to the relevant stages of the

design process. Make sure that you remain to-the-point.

- 3 Layout: By paying attention to the layout of a report, you contribute to the readability and appeal of the report.
- 4 Visualisation: When explaining a design, make sure to use self-explaining, clear visuals (2D and 3D sketches and renderings). Do not forget to explain how the intended users in the intended context will use your design.

Technical Documentation

The most important objective of technical drawings is: Unambiguous recording of a design in order to:

- 1 Evaluate the design result (discussing with yourself and other parties)
- 2 Explain the production of the product, including assemblies (to production engineers)
- 3 Control dimensions/measurements
- 4 Calculate and discuss sales (e.g. quotation)
- 5 Communicate maintenance and disassembly
- 6 Certify the product.

In order to be understood by all parties involved, the technical documents have to meet the TecDoc international norms, these are conventions for:

- 1 The way of drawing
- 2 The representation of parts
- 3 The recording of parts.

There are 4 types of drawings to be distinguished:

1. Total assembly (according to conventions!)
2. Mono drawings (according to conventions!)
3. 3D renderings
4. Animations.

The 10 TecDoc commandments for Bachelor students at the faculty in Delft are:

- 1 The identified parts should be fully described
- 2 Scales should be clear
- 3 It should be clear who the draughtsman is (name)
- 4 Projections should be right
- 5 The number of views should be limited
- 6 Lines should be clear
- 7 Symmetry should be obvious
- 8 The shape should be established
- 9 Parts should be detectable
- 10 The parts list should be complete.

References and Further Reading

Laaken, van der, M. and Laaken, van der, B. (2007) Presentation Techniques. Bussum: Coutinho Publishers

For IDE staff and students:

Werkboek Technisch Documenteren IO1010/IO1050/IO2050 (2009-2010) (Workbook Technical Documentation IO1010/IO1050/IO2050)

See: <http://www.microwebdu.nl/bestellen/tudelft> (Printing on Demand).

This workbook includes a CD-ROM with Tips & Tricks (including the 10 TecDoc commandments) and a selection of relevant norms of the digital reader "Technisch Documenteren" (Augustus 2004).

See: <http://blackboard.tudelft.nl/bbcswbdav/orgs/tud-ed-io-tecdoc-snaps/Dictaat%20TecDoc.pdf>

Reflection & Design

The Delft Design Guide

3.3 Reflection & Design

What Is Reflection?

Reflection is reconsidering or pondering on something (an experience, a theory, an event etc.). In the context of design education, reflection is an essential instrument in the learning process. Learning is a cyclic process: performing, becoming aware of what we do or think, understanding it, imagining what to do in a future situation, performing, becoming aware again and so on. In order to become aware of what is successful and what not, we have to look back and forth and reconsider what has happened and what might happen. This whole process we call 'reflection'. In the context of the design courses we distinguish between 'reflection on design methods' and 'reflection on personal design behaviour'.



Why Reflection?

Learning how to design is a complex process: designing is an activity that requires a multitude of skills, techniques and methods and uses various disciplines. Learning how to design implies mastering the skills, techniques and methods, and learning about the various disciplines involved in designing. You master the skills, techniques and methods by applying them in design projects. Through reflection on your project and learning process, you are able to design more efficiently and improve your skills in each consecutive design course. Using various reflection techniques helps to extract important learning based on experience, which is unaccountably richer than can be described by some theory. Of course, both are important, and it is through reflection that a conversation can develop between experience and more general theoretical models and theories.

Reflecting on Design Methods (the Process)

Some examples:

- 1 A specific design method at some point appeared not to be as successful as expected and needed some changes in order to be useful for the project. For example, the morphological chart is normally used to find basic solutions for technical problems. When used for other, less technical problems (for instance for the inventory of subsolutions for a specific idea), the morphological chart is useful but not in the way as intended. You might miss the profit of this method. In order to understand the method it is therefore useful to reflect after using it by asking questions such as: How did I use the method, what is the difference with the original idea of the method, did it work and can it be done again under the same conditions?
- 2 A specific design approach does not produce satisfactory results. For example, you start to draw design solutions for an initial problem, but cannot think of more than three solutions. Design methods such as brainstorming can be helpful. However, methods are often used the wrong way and may thus lead to inappropriate or dissatisfactory solutions. The solutions are rejected and the method used is blamed wrongly as 'not useful'.
- 3 When using an LCA (Life Cycle Analysis) you may not be able to maintain the discipline to ask yourself over and over again: "which process is influencing the product during the previous main process or subprocess". Due to the lack of discipline the LCA becomes corrupted and incomplete. You then tends to reflect on this method as 'not suitable for me'. The design method is wrongly rejected.

Questions that are helpful to reflect on the design methods used are:

Reflection & Design

The Delft Design Guide

- 1 Which method have I been using, what was my experience with it, what aspects triggered my mind and do I have any recommendations?
- 2 What has happened so far, how did I use the method and did it lead to satisfactory results?
- 3 How will I proceed and why adopt this particular way forward?

Reflecting on Design Behaviour

Two examples of personal behaviour that do not lead to satisfactory outcomes:

- 1 You are generating lots of ideas and gathering more and more information while running out of time. This might be due to the inability to make decisions. In the section 'Traps' this is called the trap of 'postponing decisions'. Reflection on your personal behaviour can help to gain insight in order to develop strategies to replace your unsuccessful behaviour by successful behaviour.
2. A student is getting lost in details (a trap) and thus losing the overview of the design task. Reflection will help to become aware of this behaviour and to look for new, more successful behaviour. In the section 'Tricks' the advantage of having a 'helicopter view' is explained.

Theory

Kolb has published some literature about reflection, for example the 7 steps: *Learning to reflect*, November 2000 Source: www.oro.hva.nl

- 1 How did I perceive the situation and how did I interpret it?
2. Which goals did I set on the basis of step one?
- 3 Which approach did I choose and on the basis of which considerations?

When Can I Use It?

It is important to reflect in time (just after the subject you want to reflect on) in order to remember the important aspects. You can use the reflection method just after completing a specific activity. This activity can be an applied design method (for instance a brainstorm session) but also a range of activities, for instance one completed in a specific design phase. Reflection on a regular basis, for instance every last day of the week, can also be very useful.

How to reflect?

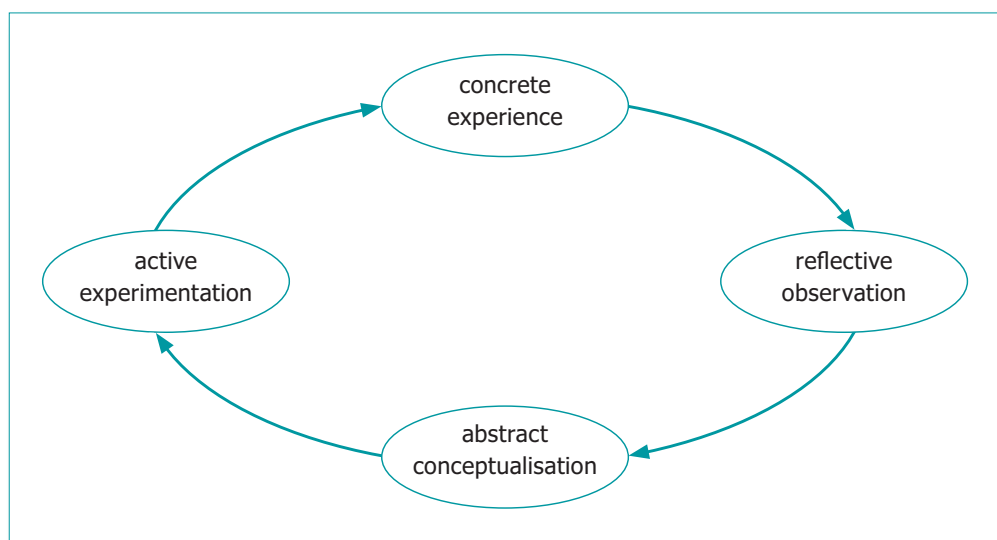
Possible Procedure

1. Experiencing (awareness)

Make notes of your remarkable events, they might have been difficult or are worth thinking over for some reason. This might be directly related to design methods, but may also be related to a specific event, design challenge or problem. By reporting your experience you strengthen your awareness.

2. Understanding (analysis)

'Unpack' the events by questioning yourself. What causes can you distinguish for your results? Which theories are supporting you? What is your personal opinion? Do you know comparable situations?



The Delft Design Guide

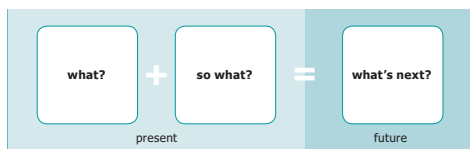
3. Imagining continuation (synthesis)

Question yourself and look for answers that are useful for the next steps in your project or in a new project. How will you approach a comparable situation? When have you achieved what you want? And how will you achieve what you want?

4. Applying (performance)

Use your insights in a next design activity, phase or project. And so on with step 1 (it is a continuous cyclic process!). Step 4 is actually not part of a written reflection, but of course it is an important step of the learning cycle.

A shorthand version of the above process is: What, So What, What's Next? (Developed by Marc Tassoul)



1. What?

What events and items do you remember? List all the things that you have noticed, without any explaining or elaboration. It is just a list of possibly interesting subjects to reflect upon.

2. So What?

First, select a limited number of most interesting or relevant items from the above list (often somewhere between 3 and 7 items) – and 'unpack' each of these

with questions such as 'Why did I notice it? What was the effect? Was it a good step? Was it fruitful? Did I run into trouble? Why was it successful?' and so on. In this way you are building an understanding of the event or item.

3. And Now What?

What will be your next action in relation to the considerations generated in '2'? These can be learning how to approach some question next time, it could be a change in your process, it could also just be the discovery that your approach did work, and that for next time, you need to remember this procedure when you get into a similar situation.

Tips and Concerns

- Reflect on the right moment, not at the end of a project, but immediately after using a method, or at moments when the design process exhibits remarkable changes. You should report your reflections in text (usually once per week) to show how the process took place, what methods you used, how you experienced them and where they were used differently. In other words: "What, How, Why and Where from here?"
- Make a distinction between reflection on design methods and a reflection on personal design behaviour.
- When reflecting on design methods, refer to the literature you studied in order to understand the design method. Your tutor will assess your reflection by answering the following questions:

- 1 Does the reflection show that you understand the method?
- 2 Have you explained why a certain procedural step was taken?
- 3 Have you properly reflected on all relevant steps during the design process?
- 4 Do you exhibit an insight into the usability of the method?
- 5 Have you used the method correctly and, if not, has the student properly described and explained any alterations?
- 6 Have you displayed a capability for self-assessment using a certain helicopter view?

References and Further Reading

http://www.oro.hva.nl/files/attachments/lp_refl_reflect-nieweg.306-0.pdf

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Traps, Tricks and Strategies & Concept Development

The Delft Design Guide

3.4 Traps, Tricks and Strategies & Concept Development

Introduction

At our faculty, and specifically in our design courses, we devote considerable attention to the *process* of designing. Methods and techniques are described, experienced and used. They result in a well-defined and developed product. The basic cycle of designing, which involves structured phase models of the design process, morphological analysis, evaluation strategies (Roozenburg, 1991), helps the designer to achieve the desired result. One of the most important phases is the period in which the product is conceived. This period starts after the analytical phase (defining the problem, analysing the target group, etc.) and ends somewhere in a phase of materialising the final concept. During this period, many decisions are made that have great impact on the outcome. If we divide this phase into two sections, we can derive concept-forming and concept development elements. For concept formation, several techniques and methods are available to generate ideas, such as brainstorming, morphological charts and Mind Mapping. Eventually, this path will lead to a basic concept. However, there is a shortage of supporting techniques for concept development. Trial and error seems to be the guideline in a phase in which uncertainty, change and stress are key issues. It is a phase that ends with a feeling of 'Eureka!' if everything comes together and the balance sought is found. Complex integration problems occur and there

is a need for detailed information. We are still able to use the aforementioned methods and techniques in parts of this process, but reality is far more complex and every single action will affect the overall outcome. Considerations of price, manufacturability, material selection, construction, usage and form all interact with each other and put pressure on the designer's responsibility. In contrast with the many methods and techniques for idea generation, there is a lack of similar methods for developing the concept into an end product that satisfies the defined requirements.

Delft's experience of teaching design has enabled us to identify some 'traps' that constitute obstacles for students in making the right decisions at the right time. Obtaining an insight into the traps and devising 'tricks' to overcome them will help you to complete this phase successfully.

Traps

Narrow View

When confronted with multiple design problems, you may often be inclined to focus on one specific aspect or problem if it happens to be the easiest part of the total. You may put all your energy into tackling the problem, but at the same time forget about its relationship with other aspects of the design. Once discussed with the tutor, these relationships can

be pinpointed and the enormous amount of energy spent on the single problem may turn out to have been a waste of time. You had too narrow a view. A narrow view can occur, for example, when operating in only one field. An example is focusing on shape and forgetting to consider the production method or usability. A narrow view can also occur in designing some specific activity, such as the rather quick choice of one particular principle of operation without identifying its influence on other matters. The danger is that this influence will not become apparent until the end of the project or until a discussion with the tutor at a point in time when the chosen solution has already been detailed. It would be far better to recognise the influence earlier, before a lot of time and effort has been invested.

Compensating Behaviour

Uncertainty, a lack of experience, a lack of knowledge and a lack of information – combined with the project deadline – may force you to adopt compensating behaviour. Although you realise that the problems are complex and difficult to solve, you are reluctant to force yourself to tackle the problem. You know you should, but you don't. Instead, you fill your reports with copied information and treat a simple problem extensively on the assumption that the tutor will accept it as proof of your capability. An example is

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extensive research into operating handles, knobs and push buttons, which are copied from literature accompanied by handwritten text, which amounts to an exact copy of the original literature.

It is understandable why you could adopt this approach. You avoid the real problems, do not see any way to get to grips with them but want to produce something all the same. This behaviour sometimes acts as a decoy, in spite of the fact that it might help to set the mind at ease. Simply staring at a blank piece of paper is no help at all.

False Solutions

One of the most significant 'traps' is the development of false solutions. Given a certain design problem, most of you know that alternative solutions should be developed to allow an evaluation as a stepping-stone to the right choice. We know from experience, however, that students first report all possible solutions, including theoretical ones, only to discard all of them except one. If a hinge has to be designed, for example, you may typically produce a complete list of solutions for a hinge, like a hinge for the cover of a piano, a hinge for normal doors, welding hinges, a snapping hinge for plastic boxes, a simple pin-and-bushing, a plastic hinge made of POM like the ones used in cheap suitcases and so on. After making this list, you reject the welded hinge because the product is made of plastics, the piano hinge is rejected because of time-consuming mounting, the snap hinge is rejected for its poor strength, the simple pin-and-bushing hinge is discarded because of its poor shape, the door hinge because it needs too much room. The last remaining solution is chosen

because it is simple, cheap and fits very easily to the plastic base of the product. All of the rejected solutions are actually 'false' solutions. In effect, you automatically include solutions that are not solutions, on the pretext of allowing a responsible choice to be made.

Clamping

Clamping occurs when you have developed a part but does not wish to relinquish it. To some extent, this is due to a narrow view, but your stubbornness or fixation can also play a role. It is not easy to let go of a solution once it has been developed, because other problems not yet recognised remain attached to the solution. Clamping often happens unconsciously. This may be the case if the design has been examined initially and judged to be more important than construction, cost price, assembly, ergonomics and so

on. A single aspect is given dominance above all other aspects, creating the danger that you must exercise all kinds of manoeuvres to find halfway decent solutions to the other aspects. Sometimes you will recognise that the dominance of the single aspect is wrong, but will know that a lot of energy has already been devoted to it, the result being a tendency to avoid redesign.

Suppressing Individual Development

Another trap when developing concepts - more specifically in the early years of study - is that you play yourself entirely at the service of the design tutor because of the complexity of the matter. This creates a classroom approach where the tutor is often asked questions like "What should I do?",

"How far should I go in working it out?", or "Is this OK?". The report is produced for the tutor, because the workbook says this is what should happen. However, designers need to bear in mind that not all methods are equally usable at all times. Compiling a list of requirements using 'process trees' (LCAs) may result in a large degree of completeness, but it is cumbersome and time-consuming. What is more, after reading the report, people could be discouraged from using process trees. Slavishly integrating anthropometric data in a design may look tempting, but in many instances there are also other factors that influence dimensional characteristics. People usually wear shoes, they are clothed and the optimum ergonomic dimensioning is not always meaningful. Everybody will recognise that fold-up seats in trains are not intended to be sat on for hours on end. Matters of this kind result in dutiful activities in which a person's own contribution is suppressed and thwart individual development.

Postponing Decisions

Putting off decisions can be right in many cases, but they do have to be taken as time progresses and the deadline appears on the horizon. Repeatedly postponing decisions can result in delays. If a tricycle has to be designed, it seems to make sense to decide right away to equip the vehicle with three wheels rather than two wheels or more than four wheels. If costs are an issue and the client does not wish to invest in producing wheels, an immediate step can be taken to obtain information about existing, obtainable wheels and a decision can be made fairly quickly.

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Lack of Argument

Very often, a design tutor is unable to see why a decision is being taken. All the way through to later years, decisions are taken that appear to be based on nothing. An example is a student who has drawn eight different screws and then declares to have opted for screw A. That's it. No further explanation. A decision sometimes stems from a gut feeling, but the point is that some kind of motivation and argumentation must always be given to support the decision. This matter is obviously related to a predefined basic principle, an analysis conducted earlier or a certain philosophy.

Some tutors say that during the course you must ask yourself "Why?" before everything that you do. There is usually a justification, but it is not always made explicit and in such cases the tutor has no option but to conclude that no arguments exist. The situation may be different after your study, as in the case of the celebrated designer who had designed a wonderful product, and when asked about the underlying motivation replied: "I may have laid the egg, but I'll leave the cackling to others."

Tricks

Helicopter View

One of the most important attributes of the designer is the helicopter view. From time to time, it will be necessary to step away from the elaboration of a certain problem in order to zoom out to a higher level so as to survey the consequences of possible decisions in other areas. Only with such an overview you will be able to integrate your solutions and combine them into a whole. This applies to product properties, but importantly also to the path being followed and the process. Adopting the helicopter view early on in the development of the concept also promotes the will to change, helps to distinguish primary matters from secondary ones and thus to determine a strategy. Similarly, a helicopter view is indispensable when evaluating solutions for product properties. Everything is interconnected and the right decision can only be taken if you have an overview. The method of presentation - the illustration of the brainchild - can also have an influence in this regard. So show where the details are located in the design, make complete cross-sections instead of zoomed-in sketches that 'conceal' the rest of the product. This is advantageous not only for the design tutor, who needs to form an impression, but also for you as a student, because it facilitates a far earlier discovery of other problem areas.

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Change

Be aware that theoretically anything is still possible during the development of a concept into a sketched design. During the process, you obtain a progressive insight, more information and more experience, meaning that changes occur. Reference was made earlier on to the 'trial-and-error' aspect of designing. Still more slogans are conceivable, like 'Designing means falling and getting up again', 'Designing is always two steps forward and one step back' and 'Designing is a jigsaw puzzle'. Choosing a certain principle does not mean you have to stick to it no matter what.

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Structure

Complexity sometimes makes it necessary to inject a little structure. As a concept is developed, the paths that need to be followed become visible, allowing a conscious choice to be made about the direction to be taken – just like a certain distance can be covered during a walk by following a route marked by one particular colour. Following all the colours during the same walk will give rise to the danger of getting lost or going round in circles. So examine beforehand how much time there is and what goals must be achieved. A different analogy is the one with a jigsaw puzzle. When people tackle a jigsaw puzzle, they will not pick up an arbitrary piece to compare it with all the other pieces until they find one that fits it. Usually, people will create a framework, sort the pieces according to colour and try to form an impression of the result. Green pieces will generally be placed at the bottom and blue pieces at the top. However, a prearranged structure can also have a slowing effect. It often happens that a person has worked correctly in terms of structure and process, but that the product turns out to be unsatisfactory. From time to time, therefore, it can be beneficial to depart from the structure to examine the matter from entirely different vantage points. This, too, has to do with the helicopter view - step away and allow yourself to become detached.

Analyse

A tool for injecting structure is formulating basic principles at every level of the design process. Performing a shape study is not merely a question of drawing all kinds of shapes and then choosing one. It can be preceded by formulating basic principles like "What impact do I want the design to make on the user and how do I translate that?", "At what levels can I view the design and at what level should I start?" Try to define a certain philosophy on which to base the shape study. At a constructional level, too, it can be useful to formulate basic principles. And in almost all cases, an initial analysis of the problem or subproblem can be instrumental in demarcating the scope for a solution and in creating a framework from where solutions can be generated. Conversely, it can sometimes be more comfortable simply to start sketching to form an impression of the possibilities that exist. As you sketch, a philosophy will unfold that can serve as a basis for taking decisions.

Balance

Taking all disciplines into account - designing is a multidisciplinary activity - the key to success is to find a satisfactory answer to all the aspects involved. Everything is connected with something else and the art is to dilute certain aspects in order to make others tastier. It is about finding a good balance between design, cost price, usage, production and so on. Few people are capable of excelling in all aspects, and it is an almost impossible task in Bachelor design projects within the allowed period of time. Striving to achieve the balance and the will to make concessions should obviously not result in a design in which everything just barely comes up to standard, because an excellent design can counterbalance a high cost price. The efforts must result in a design in which everything has been optimised. This optimum must

be achieved within the defined requirements and wishes, while fulfilling the formulated basic principles and goals.

Knowledge, Information and Communication

It may be assumed that knowledge will always fall short of what we need and there will always be a need for information. Although a very large volume of information is available, we again have to contend with pressure of time and the goals to be achieved. But one thing is certain: during the development of a concept there will be a need for relevant information and specific knowledge. The strength of an industrial designer lies not so much in his own knowledge as in communicating with specialists and finding information. The products around us are a permanent source of information. When confronted with design problems, an analysis of existing products can yield immediate solutions or generate solutions. Similarly, by disassembling and reassembling products we can gain an insight and practical know-how that will undoubtedly prove useful at some stage. The design tutor will in some cases obviously be able to impart knowledge, or in any event provide advice on where information may be found. The technical documentation centre possesses a great deal of information and there is no ban on consulting a specialist or other design tutor at Delft University of Technology or at a company. Very often, short but informative telephone calls can be very helpful. On the process side, too, knowledge is necessary; carrying out a shape study or developing theoretical solutions can be preceded by an examination of the related literature.

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Strategies

Awareness of the aforementioned traps and the informative comments made in the second paragraph should lead to a degree of reflection, but the question that obviously remains is this: "Is there a certain method or strategy for developing a concept?"

Should you start with a rough idea and work it out in increasingly greater detail as you head towards the final goal, or is it wiser to attempt early on to make allowance for everything? Given the idea chosen at an earlier stage, it is first advisable to indicate why that particular idea was adopted. Which objectives will be achieved by means of this idea? Is there anything unique about the idea? And has the thing that makes this idea unique actually been requested in the assignment? Ideas are often challenging, because ultimately "they are just ideas" and it is true that just about everything is possible. When developing a concept, the important thing is to go on demonstrating or examining the possibilities of the idea. This makes the beginning of development clear and it is unwise to predetermine the end of development. Some information about this matter can be found in the workbook or is obtainable from the tutor, but to some extent the person involved will have to indicate how far a design will be elaborated and how this must be recorded.

The 'Fish Trap model' of Wim Muller

One of the few people to devote attention to the development of concepts is Wim Muller in the description of his 'Fish Trap model' *Order and Meaning in Design (Muller, 2001)*. Muller describes the method, distinguishing three phases: the structural, formal and material phases. In each phase, variants (sketches) are drawn, which are subsequently categorised. By tracing common features within the categories, it is possible to develop representations into concepts in each category. In the formal phase, a start will be made on materialising the structure developed earlier as a basis. This is the phase where the product is given shape, based on a certain material embodiment. In the material phase, the production of the idea is once again the central consideration, with variation occurring particularly in the 'making' aspect. By categorising and estimating the use and treatment of the 'solution types' developed from the categories, this procedure leads to one or more sketched designs. Muller thus

describes a method but the use of this method is no guarantee against avoidance of all the dangers described earlier. However, the method in itself does minimise 'clamping' and a 'narrow view', although if you slavishly follow this method without self-criticism you run the risk of ultimately being faced with a product that is far from ideal.

Describing Design by Kees Dorst

Designer and researcher Kees Dorst examines the properties and limitations of the present design methodology (Dorst, 1997). He developed a methodology that devotes attention to the practical side of designing, with subjects like learning through experience during design projects, the designing of an integrated product and the approach to a concrete design assignment. The thesis describes and examines five strategies against a backdrop of an actual design assignment given to nine experienced designers for completion within a limited time.

a Abstract – Concrete

This strategy is built on a certain level of abstraction, where it is possible to define a central but rather abstract basic idea and to make allowance for all aspects of the design problem at that level. From there, the designer 'descends' to a more concrete level where reality starts to play a role.

b Divide – Solve – Reconnect

This strategy first divides the problem into distinct subproblems, which are then solved before being reconnected to each other. This strategy appears eminently usable for the concept development phase, because the kick-off idea can easily be divided up into aspects that must then be elaborated in greater detail and, as such, can be regarded as subproblems. Experience in design education, however, is that 'reconnecting' frequently gives rise to problems. The individual parts can be solved, but forging them into a whole is not always a simple matter.

c Adopt – Adapt

This strategy is based on adopting a certain solution structure, which is then transposed to the design problem. A comparison is possible with synectics, where you first distance yourself from the original problem in order to discover analogies and then reconnect them by means of a 'force fit' to the

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original problem. Dorst (3) does point to the danger that, without a thorough analysis of the design problem, all kinds of assumptions will quickly be made and conclusions will be drawn hastily.

d Prioritise – Solve – Adapt

To obtain a properly integrated design, this strategy first splits up the design problem into elements that have different priorities. It is obviously important first to solve the problems with the highest priority before making the fit with problems with a lower priority. Interestingly, dominance is held to be a trap in 'clamping'. Apparently, the priority will have been set incorrectly in such a case.

e Start – Correct

This strategy simply starts by taking a problem and correcting your standpoint as soon as a problem occurs. It resembles a glass maze, in the sense that you will get out of it sooner or later, but it can take a long time if you are unlucky.

Evaluation of the Strategies of Kees Dorst

Both of the first two strategies are particularly useful if it is necessary to limit the volume of information that has to be processed in one go. The 'abstract - concrete' strategy is used very little for the design of products. The last three are especially handy when there is a need to limit the number of connections between all aspects. The strategy of 'adopt - adapt'

obviously requires previous experience of product design, which at the start of the second year of a design course is barely present if at all, while the 'start - correct' strategy is by definition highly untargeted and inefficient. The research conducted by Dorst demonstrated that the two best designers (of the nine) used 'prioritise - solve - adapt'. This method therefore produces good results. At the same time, however, Dorst mentions that the strategies can also occur as a mix within one and the same design assignment. Moreover, it is not automatically so that the last strategy always results in a poor design. It is important to recognise that Dorst in his research advocates making a designer aware, by means of reflection, of his pattern of actions so that, if necessary, the right course can be set.

Conclusion

It may be clear that there is more than one road leading to Rome. It makes sense to use a process framework - like the edges of a jigsaw puzzle - within which a design must be created. A frame of this kind is formed on the one hand by the list of requirements and on the other by the designer's own vision, making it possible to determine whether the chosen idea will fit into the frame. From there, it appears wise to divide the chosen idea into distinct subproblems. No matter what design problem is involved, a prior analysis of the problem appears to be essential.

