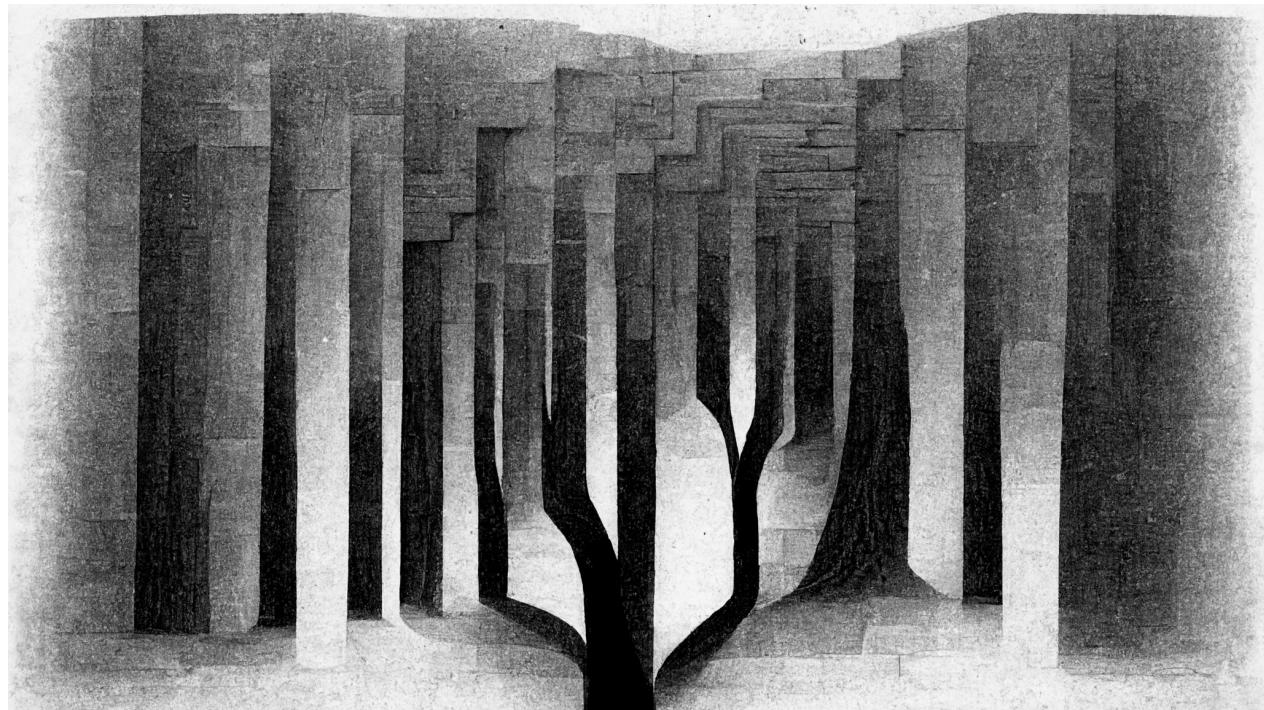


CREATIVE
RESEARCH

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Creative Research

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What is Design?

Introduction

From the moment you wake up, you are interacting with design. Everything in the home, place of work, and journey to and from has been influenced by a designer of some kind. The degree of care for each designed artifact or system can vary dramatically causing you to experience delight, dismay, and everything in between. As design moved out of the studio and into the boardroom, the design field has grown larger in scope, and has become a tool for civic engagement and change. For this reason, a variety of ideas about what design is, how you do it, and what makes it good have emerged. I've located a few descriptions for us to compare.

In the book, *Design for the Real World, Human Ecology and Social Change*, Victor Papanek writes a rather broad definition of design: "Design is the conscious and intuitive effort to impose meaningful order." We get another, even more broad definition from Robert Grudin's book, *Design and Truth*: "The primary function of design is to shape and channel energy."

At the broadest sense of *design as a verb*, design is the act of creating or making a **choice**. In the broadest sense of *design as a noun*, design is the **result** of a choice or series of choices. All of these definitions are better understood after you have been doing design for a long time and are perhaps less useful when trying to learn how to do it. Therefore, for the purposes of teaching a person how to do design, we can consider this the working definition — **design is the process that helps a person or group create, select, modify, and organize elements to pursue intended outcomes. The results are also design.** When paired with a given field of study, we can narrow the kinds of choices a designer will have to make, and subsequently better understand the scope of their thinking. As helpful as definitions are, the downside is that they begin to silo the field. The act of siloing study into fields is a kind of violence towards design – forcing designers to ignore the forces and systems with which it ought to be concerned. With that warning out of the way, let's take a look at some lists that might give us some insight to what good design is.

Good design in list form

Famed industrial designer, Dieter Rams, has written a rather popular list of what makes for good product design, aptly called "Ten principles for good design." [1] It follows:

1. Good design is innovative
2. Good design makes a product useful
3. Good design is aesthetic
4. Good design makes a product understandable
5. Good design is unobtrusive
6. Good design is honest

7. Good design is long lasting
8. Good design is thorough down to the last detail
9. Good design is environmentally friendly
10. Good design is as little design as possible



Braun RT 20 Radio designed by Dieter Rams in 1961. Image by Nick Wade.[2]

On page 29 in *Design and Truth*, Robert Grudin assembles a slightly longer list:

1. Good design is in accord with nature and human nature
2. Good design is in harmony with its immediate surroundings
3. Good design converses with contingent technologies
4. Good design helps to develop skill and/or imparts knowledge
5. Good design extends a user's sensibilities and freedom
6. Good design projects simplicity
7. Good design minimizes difficulties and dangers
8. Good design conveys a sense of beauty
9. Good design gives pleasure to use
10. Good design is not unreasonably expensive
11. Good design is sustainable
12. Good design allows a user to perform optimally in engaging reality
13. Good design can be delivered, installed, and repaired conveniently

While inspiring, these lists do little to explain the process behind good design work. A design studio called Intrastructures has written a list that explains what actions of design means to them, and the approaches that drive their design process. From their website [3], "We define design as..."

1. **Dissecting ubiquity.** Remaining curious to the obvious
2. **Managing complexity.** Mapping our contemporary infrastructure in order to reveal opportunities
3. **Introducing proposition.** Changing from within rather than shouting from the outside
4. **Abandoning the individual.** Sharing our mind, sketchbooks and hard drives
5. **Spreading enthusiasm.** Not fearing radical optimism
6. **Bridging disciplines.** Widening the scope of design by integrating complementary perspectives

7. **Embracing diversity.** Accepting different solutions in order to distill wisdom from their shared mindset
8. **Materializing opportunity.** Condensing wild ideas into applicable products, tools and models
9. **Responding to challenge.** Acting by both thinking and doing"

These lists were not meant to be hard rules that apply to everything, but they can be helpful guidelines and mission statements when making or evaluating design.

Understanding design, art, and media

[Eduardo Navas](#) is an artist and art historian whose research centers around media production and remix theory. He describes the contemporary role of media design for digital studio art practices:

“‘Media Design’ in particular, is an interdisciplinary practice in the visual and fine arts because historically, as the term currently functions derives from new media, which in the 90s and early 2000s made possible cross-disciplinary experimentation across art and design. The terms new media art and new media design were sometimes interchangeable in casual language by practitioners who crossed over art and commercial design practice as freelancers and artists. Out of this evolution the term media design connotes something quite different from graphic design as it is commonly understood in terms of careers and professions.

[...] the concept of design is not exclusive to a monolithic field. When it is by itself, it connotes abstract creative processes and methods that can be part of any type of material production—the most common one historically has been art itself. This began to change as we know in the twentieth century after the Bauhaus developed more specific approaches to art and design as specific creative concepts that for them were closely intertwined. The term design when combined with another term, such as the ones mentioned above, today functions as a very important concept to be used to describe interdisciplinarity within specializations that are by no means insulated, and are constantly influencing each other.”

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2. Wade, Nick. Braun RT 40 Radio by Dieter Rams. <https://www.flickr.com/photos/nickwade/4123875041>
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Design thinking

"In an ambiguous situation, you don't know what you don't know."

– Udaya Patnaik, Co-Founder Jump Associates

Design Thinking is the most current incarnation of terminology meant to frame and ascribe value for the role of creative problem solving within a larger system. Generally speaking, design thinking refers the methods used to strategically guide a person or group to question underlying assumptions, generate a large array of ideas, better understand user needs, synthesize prototypes, propose or build viable solutions, and more. Its roots can be traced to Participatory Design, User-Centered Design, Service Design, and Human-Centered Design. Imagining a new idea, let alone 100 new ideas, is hard and often comes with overcoming learned blocks to creative thinking. To make this process easier, modern design thinking methods tend to incorporate synectics, or methods that facilitate the connection of ideas through unrelated phenomenon.

Design thinking is considered by some to have grown out of Standford's d.school, but initial methods can be traced back to Standford's Department of Mechanical Engineering in the '50s, '60s, and '70s. The d.school established what they call "d.mindsets," or attitudes and approaches to help students better solve design challenges:

1. Focus on human values
2. Show, don't tell
3. Create clarity from complexity
4. Get experimental and experiential
5. Be mindful of process
6. Bias towards action
7. Collaborate across boundaries

Design blocks

You can think of design blocks as a kind of enemy to good design. A design block is a mental, cultural, or social hinderance to finding solutions that stray from norms and assumed knowledge and ideas. Without a willingness to push beyond what is assumed, change will be a very slow process. As Victor Papanek writes in *Design for the Real World, Human Ecology and Social Change*, "We live in a society that penalizes highly creative individuals for their non-conformist autonomy. This makes the teaching of problem-solving discouraging and difficult. A 22-two-year-old student arrives at school with massive blocks against new ways of thinking, engendered by some 16 years of miseducation, a heritage of childhood and pubescence of being "molded," "adjusted," "shaped." Meanwhile our society continuously evolves new social patterns that promise a slight departure from the mainstream but without ever endangering the patchwork of marginal groups that make up society as a whole."

Whether they are a subject-matter expert or a lay person, everyone faces implicit (unconscious) and explicit (conscious) biases that can cause misinterpretations, false assumptions, and an over-reliance on common and familiar paths to a solution. "That is the way it has always been done" or "it's just common sense" are common expressions used by someone who is operating with a common bias called Confirmation Bias. A bias, like a design block, can undermine innovative problem solving and inhibit creative thinking. Modern design processes attempt to identify where bias may exist and prevent it from harming the outcome.

On page 158 in Victor Papanek's *Design for the Real World, Human Ecology and Social Change*, he lists seven types of blocks, some of which are based on bias, and some of which are internal or external pressures:

We can list the inhibitors that keep us from solving tasks in new and innovative ways. They are:

1. Perceptual
2. Emotional
3. Associational
4. Cultural
5. Professional
6. Intellectual
7. Environmental

Beginner's mindset

A designer's approach to questioning of assumptions, known as the beginners mindset, is helpful for bypassing stereotypes and misconceptions that often inhibit empathetic discoveries. How a person acquires the beginner's mindset can vary. Here is an example from the Hasso Plattner Institute of Design at Stanford: [2]

1. **Don't judge.** Just observe and engage users without the influence of value judgments upon their actions, circumstances, decisions, or "issues."
2. **Question everything.** Question even (and especially) the things you think you already understand. Ask questions to learn about how the user perceives the world. Follow up an answer to one "why" with a second "why."
3. **Be truly curious.** Strive to assume a posture of wonder and curiosity, especially in circumstances that seem either familiar or uncomfortable.
4. **Find patterns.** Look for interesting threads and themes that emerge across interactions with users.
5. **Listen.** Really.

On page 172 in Victor Papanek's *Design for the Real World, Human Ecology and Social Change*, he lists eight methods to eliminate blocks:

Our job then becomes one of establishing methods of doing away with these blocks. Although it is difficult to make a definitive list, since there is enormous overlap between different methods, I shall list eight:

1. Brainstorming
2. Synectics
3. Morphological analysis
4. Sliding Scales
5. Bisociation
6. Trisociation
7. Bionics and Biomechanics

8. Forcing New Thinking Patterns

We won't go into detail about what each of Papanek's methods are; however, we will practice a few of them when completing course projects. There are hundreds of quantitative and qualitative design and research methods to choose from. The book, *Universal Methods of Design* by Bella Martin and Bruce Hanington, is a good starting point.

Embracing V.U.C.A.

Now change seems to be much more unpredictable; it exceeds what we have known in the past. As we view the world, we realize organizations reflect society and political needs, which accommodate expanding democracy and periods of turmoil. Bureaucracies may remain the foundation for basic stability during these periods of rapid change, but they will have to be more open and adaptable to be effective – or even to survive. [2]

Critical design failures tend to occur when tried-and-true processes, procedures, and policies are applied to solve a problem in an environment that is undergoing change. In these environments, creative problem solving and innovation are needed to address this change. The value of design thinking comes from its ability to deal in uncertainty in a dynamic environment. The acronym, V.U.C.A., created by the U.S. Army War College, describes this phenomenon – volatility, uncertainty, complexity and ambiguity.

Volatility refers to the anticipated type, speed, volume, and scale of change. **Uncertainty** refers to the idea that due to the volatile surroundings, future events can no longer be predicted. **Complexity** is described as widespread confusion and seemingly no clear connection between cause and effect. **Ambiguity** arises from the existence of multiple meanings and misinterpretations of reality.

Role of Heuristics

A **heuristic** is essentially a shortcut that helps you solve a problem quickly. You can see an example of a heuristic device, originally developed by renaissance master painters, implemented on modern digital cameras. Typically, there is a setting to overlay a Rule of Thirds grid on the camera screen, which displays two vertical and horizontal lines creating nine equal rectangles. As it turns out, if you line up your subject on one of the thirds lines, or place a high contrast object at one of the intersections, you are more likely to take a picture with good composition. Just like a visual design heuristic, there are also many cognitive heuristics to help you remember facts, do math, and particularly relevant to a designer, generate new ideas and interesting ideas. Many creative thinkers develop their own heuristic rules or devices to help them produce work.

Design thinking processes equip designers with heuristic devices that help us avoid implicit or explicit bias, form connections between new and existing ideas, understand underlying issues and themes, be more inclusive and wider in perspective, and get better outcomes and solutions. Without heuristic devices, the act of design would be a very long and inefficient process, and we might never be able to overcome the blocks to good design.

The Business Case for Design Thinking

Jess McMullin, founder of the Centre for Citizen Experience and Situ Strategy, describes a continuum of design maturity for organizations in his model, *A Rough Design Maturity Continuum*. There are five stages which range from having no strategic design to using design for identifying and framing central challenges and opportunities.

1. **No conscious design:** The organization has assigned no value or priority to design. The product that results is deemed good enough.
2. **Style:** Design is considered a secondary cosmetic process that makes a product more palatable for consumption. Aesthetic trends drive products.
3. **Function and Form:** Design is applied as part of an iterative improvement process for product development. Metrics and methods drive products.
4. **Problem solving:** Design is used in strategic processes for identifying opportunities, generating an array of ideas, and selecting solutions for existing problems. Problems drive products.
5. **Framing:** Design drives disruptive innovation. Design is used to frame the organization's agenda, and to scope interest. Ideas drive products.

The organizations that incorporate design into the framing and problem solving end of the design maturity continuum are highlighted in the [Design Value Index \(DVI\)](#). The superior performance of the index in relation to the S&P 500 is used to make the case not only for investing in design-driven companies, but as further evidence for why design should take a larger role within large organizations.

References



Systems thinking

A design decision that considers the impact on an entire network of affected systems, rather than a specific part, is known as systems thinking. Systems are bounded, can be nested, overlap with other systems, are autonomous in operation, parts can be distributed or co-located, can interact with the larger environment, and tend to be invisible.

Design can happen at every scale. At the small scale, humans can collide single atoms together to investigate theoretical physics or to create very large bombs. At the large scale, complex social and technological systems can impact the global climate affecting every living organism on Earth. Understanding the scale you are designing for will have many implications for your process and design outcomes. Systems thinking plays an essential role when designing for large scale, as there are many forces that will affect your design that are out of your control.

If you consider that an expert in any given field is an expert on the system or systems situated in that field, then people who work across systems from different fields can be considered to be transdisciplinary. A transdisciplinarian is a multi-systems worker and takes liberty to follow the networked paths for more holistic perspectives on problems and issues.

Cradle to Cradle

When thinking about a model to aid sustainable design, the term **Cradle to Cradle Design** was coined by German chemist Michael Braungart and U.S. architect William McDonough in their book, *Cradle to Cradle: Remaking the Way We Make Things*. Cradle to Cradle Design accounts for wellness, social, economic, and ecological systems in the design model when producing consumer products, infrastructure, and services. The Cradle to Cradle Design model is a shift in perspective on the traditional product lifecycle – known as Cradle to Grave, a model where products eventually cease to be useful – and instead imagine how products can be made of biological or technical "nutrients" that are reused over and over. As a proof of concept, their 2002 book was printed on special synthetic paper, intended to be an example of a technical nutrient.

This book is not a tree.

It is printed on synthetic "paper" and bound into a book format developed by innovative book packager Charles Melcher of Melcher Media. Unlike the paper which we are familiar, it does not use any wood pulp or cotton fiber but is made from plastic

resins and inorganic fillers. This material is not only waterproof, extremely durable, and (in many localities) recyclable by conventional means; it is also a prototype for the book as a "technical nutrient," that is, as a product that can be broken down and circulated infinitely in industrial cycles—made and re-made as "paper" or other products.[1]

The "S" word

The [Designers Accord](#) was a five-year project that culminated in the development of guiding principles and methodologies for integrating sustainability into design and teaching. This was done through design community engagement, networking, and by inspiring designers to share case studies, best practices, and ideas at hosted events. The guiding methodology numbered items:

1. Publicly declare participation in the Designers Accord.
2. Initiate a dialogue about environmental and social impact and sustainable alternatives with each and every client. Rework client contracts to favor environmentally and socially responsible design and work processes. Provide strategic and material alternatives for sustainable design.
3. Undertake a program to educate your teams about sustainability and sustainable design.
4. Consider your ethical footprint. Understand the impact of your firm, and work to measure, manage, and reduce it on an annual basis.
5. Advance the understanding of environmental and social issues from a design perspective by actively contributing to the communal knowledge base for sustainable design.

The “S” word

Talking about sustainable design is not the best way to talk about it.

Focus on leadership skills, participation, transparency, engagement, networks, human centered design, respect, and active listening. Ask students to rethink current paradigms and to envision a better future. [1]

The [educational toolkit](#) also recommends that you do not use the word sustainability when incorporating it into a curriculum, and I have followed this recommendation for the most part within course projects and other assignments. Sustainability is a central part to all good design, though it's not specifically referenced. The Designers Accord is a clear example of an organized initiative to get designers thinking more systemically in terms of environmental and social impact.

The problem of the ‘hyperobject’

Now, let us consider the issue of large congregations of plastic in the sea, described on the website for the United States National Oceanic and Atmospheric Administration (NOAA):

[How Big Is the "Great Pacific Garbage Patch"? Science vs. Myth](#) (External Website)

Essentially, there is a ton of discarded waste plastic that has found its way into the Pacific Ocean, and it is negatively impacting wildlife. Let's explore this issue through a bit of speculation. Where did the plastic come from, how did it find its way to the sea, and who might have been involved in this process? To answer these questions, we would have to imagine the shape and scope of the networked system. No actual research was performed for this speculation, but the proposed ideas are reasonable enough for the purposes of this example. In a real study, citations would certainly be required:

1. Industrial producers: **Material design, Engineering Design**
 - Availability of cheap crude-oil makes plastic easy and cheap to produce
2. Business and economics: **Business and Product Design**
 - Financial markets trade heavily in crude oil (from which plastic is made)
 - Availability of cheap plastic materials and mass production technology
 - Business goals and values do not align with minimizing impact to existing ecological system
3. Public consensus: **Public Relations and Marketing design**
 - Ad campaigns infiltrate popular culture
 - Wastefulness is widely accepted and normalized
 - Marketing campaigns are effective at selling products
4. Waste management processes: **Service Design**

- Wastefulness is good for business
- No real long-term ecological considerations for disposal

5. Government: Policy Design

- Special interest lobbying prevents ecological policies from hindering the sale of products
- Issue not prioritized by society
- Recycling initiatives are not timely and universally ineffective

Supposing this list was accurate, the next step would be to better understand the systems in which each participant was embedded so that we may clarify underlying systemic issues. Being able to comprehend and perceive an entire interconnected network is admittedly not easy. This idea becomes more apparent when considering the amount of people who disagree on the cause and effect responsible for the breakdown of a system. Modern examples of system breakdown include the 2008 global recession, man-made climate change, and the British exit of the European Union.

Critic Timothy Morton calls these systems **hyperobjects**. They are objects so large and complex, that humans can not perceive them in their entirety.

"The problem is bigger, it's a system." Curtis and I briefly discussed a word coined by the critic Timothy Morton to describe a problem so vast in space and time that you are unable to apprehend it: a "hyperobject." Global warming is a classic example of a hyperobject: it's everywhere and nowhere, too encompassing to think about. Global markets, too. But naming a hyperobject alone is of limited use; human cognition knows all too well how to file such imminent imponderables away, on a "to-do" list that's never consulted again. [3]

'Wicked' problems

To adequately describe the difficulty of designing policies to fix complex social issues, UC Berkeley professors Horst Rittel and Melvin M. Webber formalized theory in a 1973 publication around the term "wicked problem." It describes problems that are not only difficult to define, but also inherently unsolvable. They defined the following 10 characteristics of wicked problems:

1. A wicked problem has no particular form. (I.e. Poverty in one country is different from poverty in another, etc.)
2. Wicked problems can be worked on indefinitely. (Until resources run out)
3. Subjectively good or bad rather than objectively true or false.
4. No means to immediately and fully test solutions.
5. Implementing solutions changes the problem, and are therefore "one-shot" operations rather than trial and error.
6. No criteria to indicate if all solutions have been identified.
7. Every wicked problem is unique. (Problem solving process is always new)
8. Wicked problems are symptoms of other problems. (Interconnected complex systems)
9. How the problem is framed dictates how the problem is solved. (Bias heavily influences approach)
10. Planners are responsible for negative outcomes that result from the actions they take. (The stakes are high)

[4]

This list might sound daunting, but don't despair – these are not necessarily unsolvable problems. Designers have been developing ways to attack the wicked problem for many years. These problems are where design thinkers and interdisciplinary workers situate themselves. For some inspiration, see IDEO's open design community platform: <https://www.openideo.com/>

Citation

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Critical thinking

Critical thinking skills emphasize capabilities and competencies required for generating and processing information to evaluate, judge, and guide future actions. Critical thinking is not the rote memorization and retention of information. Its aim to achieve the best possible outcome for a given situation.

Critical thinking is, in short, self-directed, self-disciplined, self-monitored, and self-corrective thinking. It requires rigorous standards of excellence and mindful command of their use. It entails effective communication and problem solving abilities and a commitment to overcome our native egocentrism and sociocentrism.

— Richard Paul Linda Elder [1]

Critical thinking is a rational and intellectual endeavor. Someone practiced in critical thinking can make well-constructed arguments, locate logical fallacies, connect ideas to draw conclusions, and identify bias. A critical thinker without ethical integrity would seek to manipulate others for the sake of their own benefit. One who is ignorant to critical thinking skills would be easy prey to such a person, thereby reinforcing critical thinking as a requisite work and life skill in any modern society. It is also an imperative skill for social, cultural, political, and technological leaders to guide society in a purposeful and beneficial way.

Constructing arguments

An argument is comprised of a premise, supporting evidence, and conclusions. In a design critique, constructive arguments are meant to aid in the technical, contextual, and conceptual understanding of the design process and outcome. Four typical kinds of logic arguments include deductive arguments, inductive arguments, abductive arguments, and analogy arguments. Deductive arguments rely on direct logical connections and fall apart if the premises are proven incorrect. Inductive arguments rely on general observations and grow weaker with every observed counterexample. Abductive argument conclusions are a best available explanation for all available facts and data, connecting evidence that directly and indirectly confirms the argument. An analogy argument produces a conclusion based on another conclusion from a similar issue.[2]

In design, it is typically undesirable to have a pre-determined conclusion or outcome ahead of seeing the premises and discovering evidence. Assumptions and pre-determined conclusions can undermine innovation and invention. The term "ripping the brief" describes a design process where a designer or design team will question the project's premises to locate any false or problematic assumptions.

Design thinking and research is done to dig up evidence to guide design decisions (conclusions). In storytelling, a well constructed story is often a well constructed argument that focuses on a central theme or issue. For many film viewers, poor visual effects or a departure from plausibility breaks the premise that what you are watching is real, and pulls you out of the illusion.

Ethics

Ethics is a rational study of moral dilemmas within human action and thought. Morals are codes of conduct defined by personal or socially-imposed beliefs and values. Ethical studies help ascribe an act to be considered moral, immoral or amoral. To be **moral**, the action or thought must be within established codes. An **immoral** act is a thought or action that disregards established moral codes. An **amoral** act or thought has no relevance to established codes.[2]

Ethics issues are also design issues because design is an aspect of human action that can have dramatic consequences to a person's livelihood and mortality. For example, Facebook has come under fire in recent years for running experiments meant to manipulate their user's moods and implementing privacy controls that automatically revealed private information to a user's personal network. If designed carelessly, social media can inadvertently enable bullying, push certain at-risk individuals to suicide, cause the loss of employment, expose minorities and people of alternative lifestyles to mortal danger, and negatively affect familial relationships. Examples of these consequences are well documented and make a compelling case that design decisions in the tech industry are failing ethics tests.

Victor Papanek published the book, *Design for the Real World: Human Ecology and Social Change* in 1971, where he connected problematic ethics and sustainability issues to the role of the designer. He was met with tremendous backlash by the design community. He was asked to resign from professional design associations and his work was publicly ridiculed. However, in the years since, Papanek's ideas have gained widespread acceptance, and *Design for the Real World* is now a required text in many design and architecture programs. In a chapter titled *Do-it-Yourself Murder: Social and Moral Responsibilities of Design*, Papanek writes, "The designer's ... social and moral judgment must be brought into play long before he begins to design, since he has to make a judgment, *a priori* at that, as to whether the products he is asked to design or redesign merit his attention at all. In other words, will his design be on the side of social good or not." [3]

A speculative near-future science fiction television series produced in the UK, called *Black Mirror*, delves into a world where ethics are a secondary consideration to technological advancement. In some cases, the scenarios are already in play in certain parts of the world, including a new *credit score* initiative in China which closely matches the plot of a *Black Mirror* episode called "Nosedive."

Critical Making

Open design heralds new possibilities for artists, scholars, and interested citizens to engage in a simultaneously conceptual and material critique of technologies and information systems in society.[4]

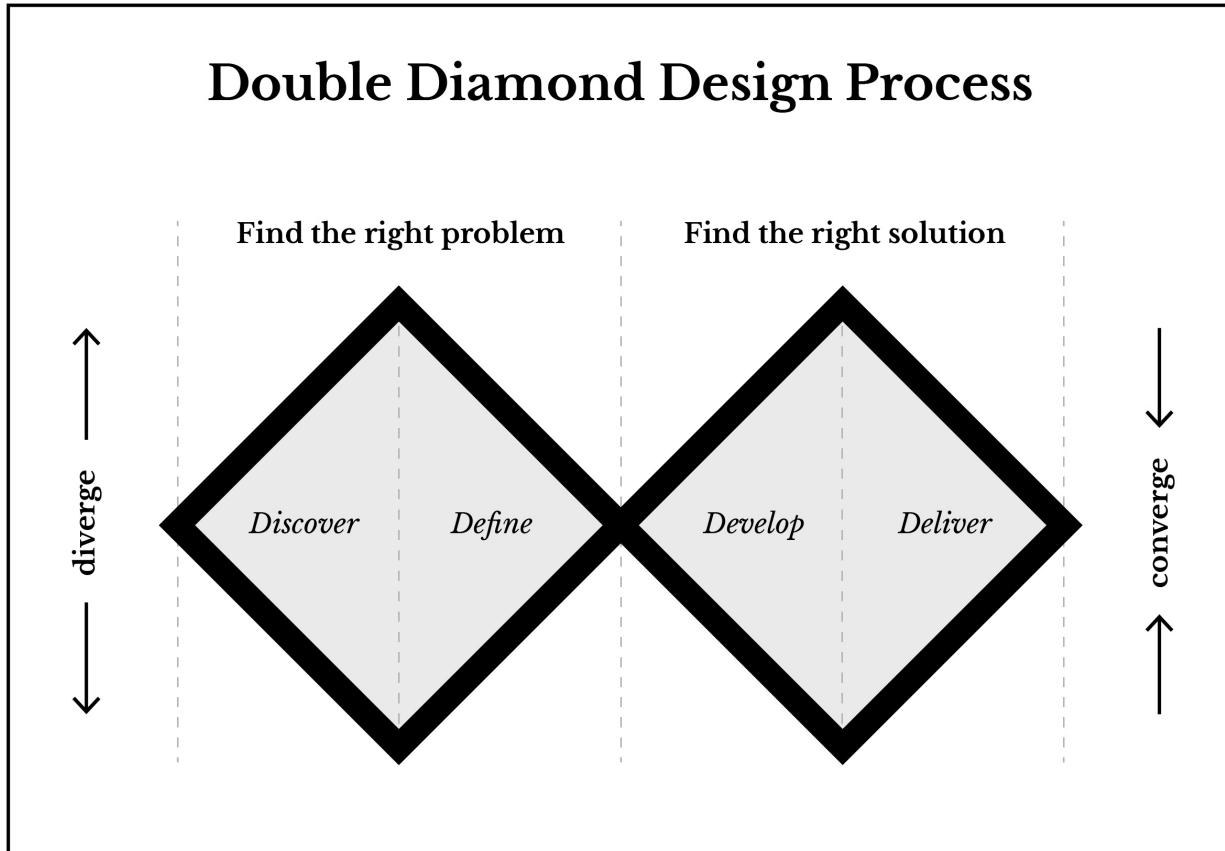
The term 'critical making' is intended to highlight the interwoven material and conceptual work that making involves. As a teaching and research strategy, critical making shares an emphasis on values with both critical design and critical practices — such as the critical technical practice[5] from which it derives, as well as value-sensitive-design[6] and values-in-design.[7]

Citation

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Design process

Depending on the industry a person works in, a set of contemporary best practices will be in fashion. If you don't know where to start, identifying, learning, and practicing those established guidelines makes good sense. If you are a seasoned designer, then adapting a process according to your own experiences is prudent, and something you would be used to doing. Innovating on an existing design process from the very start may be more inhibiting than helpful.



In this course, we will be adapting and simplifying a design process model called the Double Diamond, originally created by the British Design Council, and reimagined by [Dan Nessler](#). The shape of a two-dimensional diamond is meant to be visual analogy describing the divergence and convergence of ideas. Read from left to right, you would use divergent thinking methods to create an array of possibilities, and then use convergent thinking methods to arrive as a specific outcome or decision.

Divergent and convergent thinking

Divergent thinking refers to the thought processes that are used for producing an array of ideas that may be quite different from each other. This kind of thinking is meant to generate an abundance of possibilities to increase the likelihood of a positive outcome. Creative thinkers are particularly skilled divergent thinkers, drawing inspiration from unexpected sources and keen observations.

Convergent thinking refers to the thought processes involved with resolving an idea or solution. A convergent thinking will analyze an idea's viability with respect to available resources, capabilities, human-factors implications, environmental considerations, cost, efficiency, and many other metrics. Engineers tend to excel in convergent thinking, choosing the best options from set of possibilities.

The Four Phases



On the Double Diamond Phases diagram, you can see how two connected diamonds describe four phases, two divergent, and two convergent. The red arrows pointing away from each other represent divergence whereas the red arrows pointed towards each other represent convergence. In the left-most diamond, you would establish an understanding of the prompt and a solution plan. In the right-most diamond, you would construct the response to the prompt. Each diamond is divided into two parts, creating four design phases which we will refer to throughout course projects.

The **(1) Discover** phase is where you will gain a better understanding of the project and its goals; the **(2) Define** phase is where you will narrow and form the project's direction; the **(3) Develop** phase is where you will explore production methodologies, prototype, and experiment; and finally the **(4) Deliver** phase is where you will iterate and refine your project. This process model will be used to complete projects with an added discussion phase at the end. Though this process is not necessarily a linear methodology, we will be progressing through projects in a linear fashion.

At any given part of this process, you may be asked to give form to the work you are doing. You should be prepared to communicate progress verbally and visually, giving equal importance and attention to in-process work as is given to the final product.

1. Discover

The discovery phase is all about questioning and researching. To better understand the nature of a problem later in the process, it is helpful to gather as much raw information and data as possible.

Research

Almost any design process will have some research component. **Qualitative** research refers to open-ended and unstructured research that can be obtained through interviews, surveys, questionnaires, observation, and exploration. This type of data is descriptive and more difficult to analyze. **Quantitative** research deals in data that is measured and tends to be easier to process. Correlations, causal relationships, and trends interpreted from findings are subject to the researchers bias and assumptions.

Ethnographic research is concerned with learning about how people live their lives, and ethnography techniques are often used in human-centered design. You can obtain this by doing field work, a kind of **primary research** where you make observations, conduct interviews, and more, or by doing **secondary research** which typically involves book or Internet searches for existing information.

2. Define

With research completed, you can now focus on identifying underlying themes and forming concepts. The end of this phase usually culminates in a **How Might We** (HMW) question, where the end-goal of the project then becomes trying to answer the question.

Articulating the true nature of a problem in this phase helps ensure that the design process is genuinely concerned about the presented or generated issue, and serves as inspiration for the rest of design process.

3. Develop

In this phase you think of an array of possible ways to solve for the project goals worked out in the Define phase. You use design thinking strategies, prototyping, storytelling, and other methods to identify as many ideas as you can.

4. Deliver

In this phase, you build, test, and iterate a solution. Maintaining an open dialogue and getting feedback is important to ensure the work is as good as it can be. At the end of this phase, you are able to make an assertion or provide a functioning or complete solution.



[1]

Semiotics

From nature, we can see that animals have distinctive patterns, textures, and colors which serve both utilitarian and symbolic functions. Vibrantly colored insects may indicate that they are poisonous to predators while bird songs, feathers, and nests communicate sexual fitness to prospective mates. Humans are no different, displaying or obscuring attributes for the same ends. These are semiotic processes. Semiotics is the study of signs, symbols, and their interpretation. [3] The study of semiotic processes are just as relevant in art as they are in computer science. There are many contributors to the field of semiotics, including Roland Barthes and Umberto Eco.

Signs

A **sign** is composed of a signifier and signified. A **signifier** is the form of the sign and can be auditory, visual, or physical in nature. A famous play on this idea is the René Magritte painting entitled, *The Treachery of Images*, where he has painted a pipe above the words, "Ceci n'est pas une pipe." (translation: "This is not a pipe.")[2] In the painting, Magritte paints an iconic image of a pipe, but contradicts the very idea that the image is a pipe with written text. Depending on what the viewer feels is a stronger signifier, they will believe either the text or the image to be true. To understand how a sign is produced, let's look at an excerpt from Eco's *Theory of Semiotics*:

What happens when I produce a sign or a string of signs? First of all, I must accomplish a task purely in terms of physical stress, for I have to 'utter'. Utterances are usually considered as emissions of sounds, but one may enlarge this notion and consider as 'utterances' any production of signals. Thus I utter when I draw an image, when I make a purposeful gesture or when I produce an object that, besides its technical function, aims to communicate something.[1]

The three categories of signifiers are the **(1) Icon**, **(2) Symbol** and **(3) Index**. An icon resembles some physical attribute of the signified. A symbol is an arbitrary form that is connected to the signified only through cultural association and convention. The fact that you can understand this text is because it is a symbol that you have learned to connect to its corresponding meaning. An index is some manifestation or result of the existence of the signified. For instance, a traffic cone on the highway is an index for a construction zone being present.

The **signified** is the conceptual idea. If you were to write the word *spoon*, that word would be a symbol that signifies the referenced object, spoon.

Semiotics is fairly paradoxical, as it is intrinsically linked to culture. To understand why, see the following video collaboration between VOX and 99% Invisible, called [Beyond Biohazard: Why Danger Symbols Can't Last Forever](#).

Semantics

Conceptual semantics focuses on understanding how meaning is formed cognitively. If we look at a diagram of the Meaning Triangle, we can see that there is a sign—an icon, symbol, or index—which in the example in the diagram is written as the symbol "spoon." The concept of a spoon is the thought or mental act associated with referring to the spoon object. The object, also known as a referent, does not have to be a physical thing, just something that is being referred to.



Whenever someone produces something that others will interact with, they are playing in the semiotic realm, and an understanding of these mechanics will help a designer communicate more effectively.

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Inclusive design

The existing lack of an inclusively-designed environment for all people may be the greatest failure of designers, and simultaneously, the greatest opportunity to affect positive change in the world. Inclusive design, also known as universal design, is design that takes all people into account, including "extreme users." Extreme users typically have physical or cognitive differences or limitations that the majority of design does not account for. These users tend to make up a small percentage of users, and have needs that are often not considered in profit-centric businesses. It can be very expensive to revamp an existing design to meet the needs of extreme users, and design standards are only starting to catch up. For web design, inclusive design is better known as accessible design, and has made considerable advances in the last decade or so as a result of government regulations and lawsuits, most notable a National Federation of the Blind's [2010 complaint against Penn State University](#) which has since led to massive infrastructure and policy overhauls.

An obvious example of inclusive design in the built environment are building codes that require the inclusion of wheelchair ramps, minimum dimensions for doors and hallways, ceiling heights, fire escapes, railings, etc. On the web, [ARIA Roles](#) in the html help screen readers better understand web page content, along with the many other considerations encouraged by [W3C Accessibility](#) standards.

Universal access features are features everyone can use. For instance, have you ever watched TV or video with closed captions on? Have you read the transcript of a video or podcast rather than watch or listen because it takes too long? Have you ever chosen to walk up a wheelchair ramp because it allowed you to get around a slow-walking person? These options afford you more choice in how you engage with the designed world.

Dis/ability

The word disability has a controversial history. Generally speaking, it is related to people who have impairments, activity limitations, and social participation restrictions. **Disability studies** is an academic discipline that is concerned with the nature and meaning of disability as a social construction. It can also be referred to medically, or used by the disability community as a means of self-identifying. The **Disability Rights Movement** focuses on reducing social stigma and ensuring that disabled persons are afforded the same rights and opportunities as any other person. One of the most famous Disability Rights Activists, and the first deaf-blind person to graduate from college, is Helen Keller, born in Alabama on June 27th, 1880. She was an author, lecturer, and a principle fundraiser for The American Foundation for the Blind. More than a century after Keller was born, the Americans with Disabilities Act (ADA) was enacted on July 26, 1990. The ADA, in conjunction with other legislation, provides a wide breadth of protections and accommodations for public transportation, housing, communication, and other public services.

One way to think of ability is as a fluid state of being. An "able-bodied" person can open a door simply by extending their arm and pulling on a handle. A person who requires the use a wheelchair may have a harder time with the same task. However, if you were to give the same able-bodied person a baby to hold and a bag of groceries, opening the door using hands has now become all but impossible—a temporary impairment that has design implications. An affordance that exists for one person does not necessarily exist for another. A potential consequence of labeling someone as disabled is the affliction of **learned helplessness**, a process by which peers or those with authority convince a person that they are unable to overcome an obstacle, and that trying is pointless.

The chief handicap of the blind is not blindness, but the attitude of seeing people towards them.

— Helen Keller

However, human beings have potential for incredible accomplishment, regardless of whether they have a disability or not. The Inuit travel [enormous distances over seemingly featureless landscapes](#) with advanced navigation techniques that help them find their way; some of the blind have taught themselves [echolocation to sense the world](#), and amputees routinely complete [world championship triathlons](#) with the aid of advanced prosthetics, a feat most people who still have all of their limbs accounted for could not accomplish. Continued understanding of natural systems and technological advancements will enable people to do things in a few years that are just not possible to do today. It seems that design and the future of human ability are intrinsically-linked phenomenon.

Empathy as a design tool

The emergence of empathy strategies for designers has changed the way products and the built environment are created. Achieving empathy means that a designer would approximate the same user experience as one of their users by deliberately simulating physical, cognitive, and environmental constraints. For user-experience designers, there are a variety of digital tools including graphics software that simulates what colors would look like if you were colorblind, javascript libraries that simulate dyslexia, visual overlays that obscure parts of a computer screen to simulate visual impairments, and many others.

Interaction Design (IxD)

Designing for interaction is the process of understanding, accounting for, and sometimes altering a user(s) mental model (what they know and how they think) to facilitate a dialogue between that user and an object, system, or event. In this way, the designer shapes the user. This does not have to be software. You could be designing a conversation between two people by providing discussion topics, a voting ballot to reduce voter confusion and errors, or a new device to make virtual reality feel more like physical reality.

... changes will be realized by designers, and by a specific breed of designers: those creative designers who are both artists and engineers and who are able to balance, over an extended period of time, technology and aesthetics without ever losing sight of the most important facet of design: humanity. [3]

Consumer product design is located in a field called Industrial Design, a term coined in the early 20th century. In the mid-20th century, ergonomics, or the interaction between people and equipment, emerged. After microcomputers were invented, product design began to include software. This shifted design away from ergonomics into interaction design.

To design an interaction, a designer must seek to know:

- True goals of the interaction (this is sometimes different than stated goals)
- Users' abilities, constraints, and mental models
- Where and how it will happen
- Constraints of the environment it's happening in
- How the interaction went

Users

ANTHROPOMETRIC DATA — STANDING ADULT MALE
ACCOMMODATING 95% OF U.S. ADULT MALE POPULATION

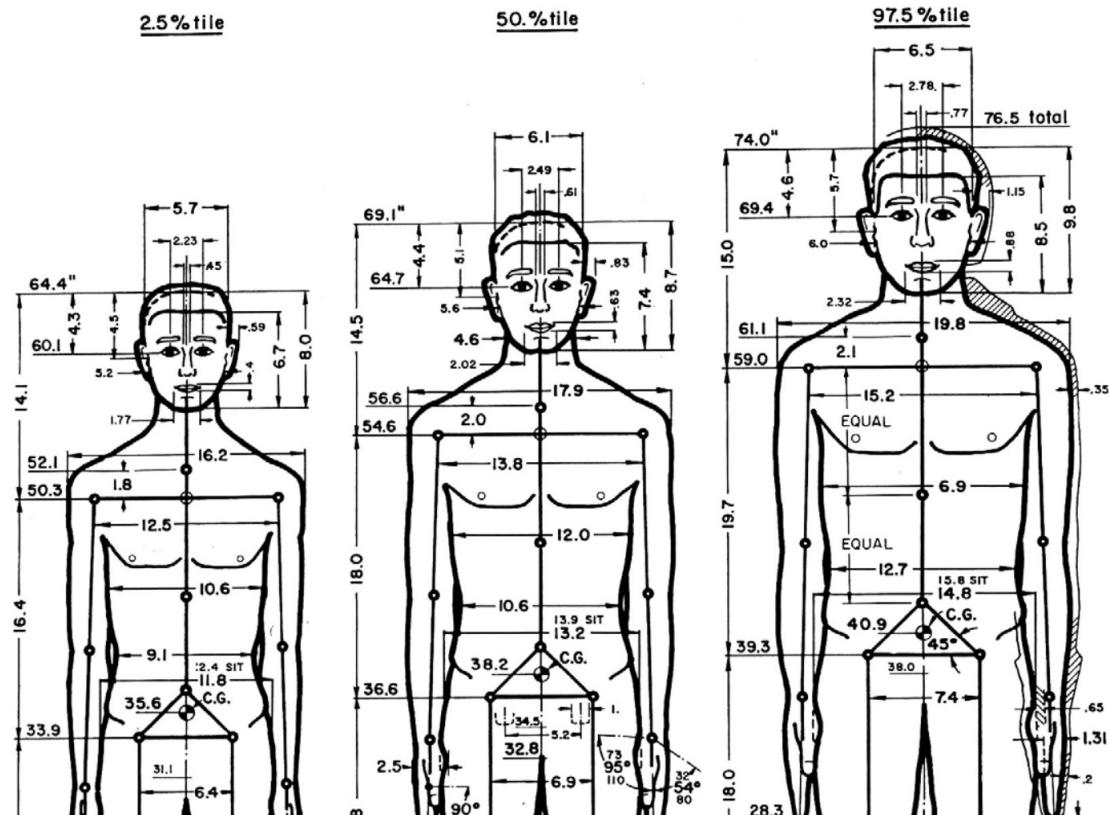


Image from *The Measure of a Man: Human Factors in Design* by Henry Dryfuss

The term "user" is meant to describe a person who is intended to interact with something that you are designing, be it software or physical object. The idea of "average users," as they are conceptualized by designers, tend to not be very good representations of the real people who use the products. The U.S. Air Force found this out first-hand as they attempted to solve major flight issues in the 1950s. Pilots were having a lot of incidents, sometimes fatal, and they started to wonder if the dimensions of the cockpit, built to the average size of a 1926 male pilot, were no longer working. They took measurements of over 4,000 people with 140 dimensions of measurement.

Lt. Gilbert S. Daniels had studied physical anthropology at Harvard, and was hired to measure the pilots. He garnered skepticism of averages during his undergraduate work, and wondered how many pilots actually fit the average measurements. After crunching the numbers for the 10 most relevant dimensions, he discovered that not a single average airman existed, and using only three of the 10 dimensions, roughly 3.5% matched the average. This discovery upended the assumptions that an average-sized cockpit would fit most pilots. There was no average-sized pilot. This revelation eventually led to the advent of adjustable cockpit seats and pedals, dramatically reducing flight incidents.

Flow

The flow was named by Mihály Csíkszentmihályi, a Hungarian psychologist. Flow is a kind of mental state where a person is completely immersed in concentration and focus when performing some action. In interaction design, you typically want your users to be able to access the flow state.

Csikszentmihalyi's characteristics of flow:

1. Completely involved in what we are doing—focused, concentrated.
2. Sense of ecstasy—of being outside everyday reality.
3. Great inner clarity—knowing what needs to be done, and how well we are doing.
4. Knowing that the activity is doable—that our skills are adequate to the task.
5. A sense of serenity—no worries about oneself, and a feeling of growing beyond the boundaries of the ego.
6. Timelessness—thoroughly focused on the present, hours seem to pass by in minutes.
7. Intrinsic motivation—whatever produces flow becomes its own reward.

Ted: [Mihaly Csikszentmihalyi: Flow, the secret to happiness \(18:51\)](#)



Interaction Principles

Human-computer Interaction (HCI) is a field that emerged in the 1980s, concerned with the engineering and cognitive science implications for human use of technology. Over a decade earlier in 1968, Douglas Engelbart gave a [technology presentation](#) which was later referred to as "The Mother of All Demos." In a single presentation, Engelbart showed the computer mouse, word processing, video conferencing, hyper-text and media, addressable objects, collaborative real-time editing, and other aspects of computing that are now ubiquitous. This was a major turning point in computing technology history. Another major turning point was the 1984 introduction of the Macintosh by Apple Computer, Inc., which had the first 2D graphical user interface, otherwise known as a **GUI** (pronounced *gooey*).

There are five common interaction principles that software developers often refer to when building an interface. They dictate that an interface must be **perceivable**, **predictable**, **learnable**, **consistent**, and provide **feedback** to the user. Being perceivable means that a person, who has no prior knowledge, must be able to sense and understand an object or interface. For GUI design, this often means making the interaction possibilities visible in some way. Humans rely on predictions to navigate the world. An unpredictable environment can be frustrating, scary, and in some cases, dangerous. Design language can be used to give users cues and resources for learning. Elements that perform the same action should look and function the same way. This not only refers to visual and physical elements, but also to sound, language, and conceptual organization. Feedback is important in an interface so the user knows that something is happening.

Affordance theory

Affordance theory is concerned with the idea that the possibility for action is embedded in objects and shapes. **Affordances** are the things that can be achieved with the object in question by a particular person. Designers spend a great deal of time perfecting signifiers, so they may communicate what affordances exist very explicitly. For instance a coffee mug with a handle is explicitly telling the user (signifying) that it can be picked up by hand (affordance), and will keep the hand safe from hot temperatures (another affordance). Doors with improperly designed signifiers do not make it clear which way a door should swing.

Rather famously, Don Norman was so put off by bad doors that he wrote the book, "The Design of Everyday Things."

An excerpt from *The Design of Everyday Things: Revised and Expanded Edition*, page 11,

The term affordance refers to the relationship between a physical object and a person (or for that matter, any interacting agent, whether animal or human, or even machines and robots). An affordance is a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used. A chair affords ("is for") support and, therefore, affords sitting. Most chairs can also be carried by a single person (they afford lifting), but some can only be lifted by a strong person or by a team of people. If young or relatively weak people cannot lift a chair, then for these people, the chair does not have that affordance, it does not afford lifting.

From Norman's description, we can start to see a strong relationship between semiotics and inclusive design practices.

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Critical design

In 2009, Dr. Bruce M. Tharp and Stephanie M. Tharp published a blog post called "[The 4 Fields of Industrial Design: \(No, not furniture, trans, consumer electronics, & toys\)](#)." in an attempt to categorize design intentions. [1] As described in a followup post published on Dec. 9, 2015, "[What is Discursive Design?](#)," discursive design is described as **the practice of designing for the purpose of provoking thought.**

This, of course, demands a purposeful shift—the designed object's *primary* role is no longer utilitarian, aesthetic or commercial. Instead it is mostly (though certainly not exclusively) a thought catalyst. The product is given form and function so that it can communicate ideas—this is the goal and the measure of success. Rather than tools for living and doing, these are tools for thinking. [2]

We find a similar definition from Dunne and Raby's, *Design Noir: The Secret Life of Electronic Objects*:

Critical design is related to Haute couture, concept cars, design propaganda, and visions of the future, but its purpose is not to present the dreams of industry, attract new business, anticipate new trends or test the market. Its purpose is to stimulate discussion and debate amongst designers, industry and the public about the aesthetic quality of our electronically mediated existence.[9]

The Uncomfortable, a collection of bad product designs created by architect Katerina Kamprani, explores what would happen if the fundamental functional properties of products were altered or thwarted. The resulting collection of objects manages to create objects that are both serious and funny.

My goal is to deconstruct the invisible design language of simple everyday objects and tweak their fundamental properties in order to surprise you and make you laugh. But also to help you appreciate the complexity and depth of interactions with the simplest of objects around us.

Katerina Kamprani [10]

Speculative design

If discursive design is "design as thought catalyst," then speculative design is design as *possibility catalyst*—that is, design for the purpose of imagining new possible futures—enabling ourselves to have real conversations about what kind of world we want to build. In the 1960s, an architecture group, called Superstudio, imagined new kinds of radical architectural design, which helped push design from problem-solving to problem-seeking. This form of design has autonomy from the constraints of the market, and has the benefit of self-reflection.

And, whereas traditional design actually legitimizes the status quo, speculative design envisages and anticipates the future, at the same time helping us to understand and re-think the world of today. This approach is most often based on the question "what if?", examining the interrelation between potential changes in the technological development and social relations. [3]

Steven M. Johnson describes himself as "an occasional inventor, whimsicalist and possibilist." He [publishes illustrations of absurd inventions](#) that are hilarious and thought-provoking commentary while yet somehow retaining plausibility.

Potential Futures and the Theory of Change

Fundamentally, design—the process of bringing into existence the unknown or invisible—envisiones the future.

— Sharon Poggenpohl

Because speculative design is concerned about the future, it is helpful for us to consider something called the **Theory of Change**, which can help you map outcomes and causalities. Theory of change is concerned with figuring out what choices can be made in order to achieve positive future outcomes. Let's consider The "Three 'Laws' of Futures," as outlined by Joseph Voros, that state **(1) the future is not predetermined, (2) the future is not predictable, and (3) future outcomes can be influenced by our choices in the present**. Voros' publication, [A Primer on Futures Studies, Foresight and the Use of Scenarios](#) is well worth a read-through, and will better describe the logic behind these "laws." Essentially, they point to the idea that each present moment is the culmination of past choices, and therefore, future outcomes can be regarded as something to steward with thoughtful intent.

The New York Times article , [We Aren't Built to Live in the Moment](#), argues how the uniquely human skill of thinking about future events is a major driving force behind decisions. From the article:

"This discovery explains what happens when your mind wanders during a task: It's simulating future possibilities."

The four classes of potential futures include **Probable, Plausible, Possible, and Preferable** (referred to as **PPPP**). In future design, *preferable* outcomes are located within the realm of *probable* and *plausible*. It is most likely not very useful to imagine outside of *possible*. *Possible*, in this case, would preclude the idea of something like a square-shaped circle or a magical power—those things are impossible (with our current understanding of the laws of nature) and working such a thing into a work that tries to imagine the future is not very helpful or useful.

Beyond this lies the zone of fantasy, a zone we have very little interest in. Fantasy lives in its own world, with very few links if any to the world we live in. It is of course valuable, especially as a form of entertainment, but for us it is too far removed from how the world is." [8]



Applying Theory of Change:

Theory of change is a rigorous yet participatory process whereby groups and stakeholders in a planning process articulate their long-term goals and identify the conditions they believe have to unfold for those goals to be met. These conditions are modeled as desired outcomes, arranged graphically in a causal framework. [6]

I've adapted this list from [Theory of Change Basics: A Primer on Theory of Change](#) by Taplin and Clark.

1. Identify long-term goals and related assumptions.
2. Map backwards from long-term goal: Identify preconditions and requirements.
3. Note your assumptions of how the system works; articulate your rationale for why outcomes are necessary preconditions to other outcomes.
4. Develop strategic interventions to bring about your desired change.
5. Develop indicators to measure successfulness of outcomes; use them to assess the performance of your initiative.
6. Quality review should answer three basic questions: Is your theory 1) plausible, 2) “doable” (or feasible), and 3) testable?
7. Produce a narrative to communicate the logic of your initiative.

If you look carefully at this list, you can also simultaneously locate a place for each step within the Double Diamond design process used throughout this course, further illustrating its compatibility with other design processes. You can start to see where those steps, particularly in step 6, begin to line up within the PPPP model (described by Voros).

Citation

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Visual Design

The visual design process is purposeful creative production using visual design elements and applying design principles within the constraints of project objectives. Much of what we know about visual design was developed and perfected by the masters painters hundreds of years ago. The main goal of visual design is to take command over the viewer's eye, to lead it around a canvas or page for the purpose of communicating some feeling or meaning.

A certain painter, not without some reputation at the present day, once wrote a little book on the art he practises, in which he gave a definition of that art so succinct that I take it as a point of departure for this essay. "The art of painting," says that eminent authority, "is the art of imitating solid objects upon a flat surface by means of pigments." It is delightfully simple, but prompts the question—Is that all? And, if so, what a deal of unnecessary fuss has been made about it. [2]

Aesthetics

Why would someone want to take up their desk space with a small potted plant? Why would a person hang a painting on the wall in their apartment? Why would they buy a red chair? The answer to these questions lies in the emotional consequence of aesthetics. An aesthetic is a set of principles and elements that are used to describe a creative work, locating the intended or emergent language and subjective beauty. Aesthetics can impact a person's mood, comprehension, productivity, behavior, and can result in various forms of bias. The aesthetic-usability effect is a bias where if a design looks easier to use, then it is regarded as such — irrelevant to actual usability characteristics. For these reasons, it is beneficial to always strive for strong aesthetic execution of a creative work. [See this Medium.com article for an expanded discussion on aesthetics.](#)

Language of aesthetics

In visual design, an aesthetic language is constructed from elements that are organized based upon how humans see with their eyes. Common **elements of design** include:

1. Line
2. Shape
3. Form
4. Space
5. Color (hue)
6. Value (tone)
7. Texture

Common **principles of design**: [1]

1. Balance
2. Dominance, emphasis, and focal point
3. Movement
4. Repetition, rhythm, pattern
5. Proportion and scale
6. Variety and variation
7. Unity/harmony
8. Contrast

Gestalt principles of perception:

The following principles describe how the viewer knows that elements are related to each other.

1. Similarity
2. Continuation
3. Closure
4. Proximity

5. Figure-ground
6. Symmetry
7. Common fate
8. Past experience

If you have ever taken an art class in a primary or secondary education curriculum, you were most likely taught those principles and elements to make drawings or paintings. The elements may be specific to visual acuity, however, the principles of design aren't restricted to image making. They can be used with sound, architecture, fashion, interactive media, experience design, and other types of design.

These lists form the basis of a language around talking about design, and help us conduct a process of formal analysis with which we can then break down a work of almost any kind. This language is flexible between media and modes of creative expression. For instance, we can use the term **shape** to refer to both a geometric or organic visual element. This is its most direct and literal use. We can also use shape to describe the narrative arc of a story, where the shape of the narrative arc tells us about the high and low moments. We can even use shape to describe aspects of how an online course can be taught, indicating moments of passive and active engagement in learning. In this way, shape works as both a visual (physical) and a conceptual (virtual) idea. This ability of this language to slip between physical and virtual references makes it highly useful and adaptable for communicating about design. Creative works can develop their own unique design language, including elements and principles that emerge from the design process or appropriated from other disciplines and fields. It is often the designer's job to define the language that articulates the creative vision.

If you'd like to see examples of some of the visual elements put to use, see the [Design Aesthetics for the Web course](#) on Lynda.com. They have a slightly different list than the one listed above. I have left type out of my list because I believe that it is more of a semiotic element and I would need to include other "higher order" elements into the list—a slippery slope to an unhelpful taxonomy.

Formal analysis

One common way to make a judgement about a creative work is through Formal Analysis. This type of analysis is based entirely on what the viewer sees, and forgoes cultural and historical contexts. Something that is formally ugly can be conceptually beautiful, and something formally beautiful can be vapid and tasteless. The main advantage of formal analysis is that it helps to make feedback understandable by others. There are three steps to conduct a formal analysis:

1. Identify and name the formal element
2. Describe how it is being used
3. Discuss the effect it has with respect to the entire work.

Example of formal analysis

"The blue area above the figure seems to give me a sense that we are outdoors with a clear sky above. This gives the image a bright and positive feeling."

- **Formal element:** blue
- **How it is being used:** above the figure
- **Effect:** ...we are outdoors , ...bright and positive feeling

Representation technology

Typography

Typography is an ancient field that employed typographers who were specialists in the craft of arranging type for the purpose of communicating written language. These specialists invented and understood every facet of working with type and were the only ones capable of producing it—they were both designers and the gatekeepers for what was produced. In contrast, the advent and availability of digital word processing applications have made typography accessible to everyone, and the knowledge of type's design nuances are lost on all but those who work at digital type studios and well-trained graphic designers.

In 1439, a German goldsmith named Johannes Gutenberg had struck a business deal with investors to produce and sell small mirrors to Pilgrims at their fair in a nearby town. After discovering he was told the wrong year for the fair, he pitched the idea of the printing press to his business investors. In 1440, Johannes Gutenberg adapted existing screw press technology and metal type. Soon after, mechanized

moveable-type became popular and the speed at which knowledge could be spread exploded and by the year 1500, over 20 million books had been printed.

The printing press fundamentally changed how knowledge was recorded and disseminated, a disruptive technology that shifted power from the monolithic structure imposed by the Catholic church to individual change-makers spread across the west. Ultimately, this contributed to the de-centralization of power to localized nations, where language, laws, taxes, and cultural identities could develop independently.

Image

Capturing accurate visual information as a representational image was a laborious process that required master drawing and painting skills developed over a lifetime of practice—most famously celebrated during the Renaissance period. However, that changed in the 1830s when a French artist and chemist, Louis-Jacques-Mandé Daguerre, patented the Daguerreotype. A Camera Obscura is an ancient structure or device that allows light in through a small hole, projecting light from the exterior scene onto an interior surface. The Daguerreotype combined the projection ability of the Camera Obscura by exposing chemicals to this light, recording the images onto metal plates.

George Eastman pioneered film photography technology and began selling it in the late 1800s. The first film camera, called the "Kodak," was offered for sale in 1888. The advent of microprocessors and digital sensors capable of quickly and cheaply recording light information led to the first digital camera in the late 1970s. Now, almost all handheld computing and communication devices like cellphones and tablet computers have hi-resolution cameras embedded.

It took John Singer Sargent more than a year to finish the Portrait of Madame X (1884). The computer has enabled the average person with little understanding of chemistry, physics, or painting skills to easily and cheaply capture, edit, duplicate, and disseminate beautiful images to hundreds of people within seconds of the initial impulse.

Citations

1. http://www.getty.edu/education/teachers/building_lessons/principles_design.pdf
2. Roger Fry, "An Essay in Aesthetics" in *Vision and Design* (orig. publ. 1920; rpt. New York: New American Library, 1974), 16–38.



Identity design

People spend a great deal of time doing **impression management**, that is, managing the impression one makes on another. People want control over how they are viewed are consciously or unconsciously aligning our own behaviors to conform to a set of norms or ideals—a kind of self design. These norms drive many decisions affecting interest in clothing, sports, food, cars, education, and many other material and non-material aspects of living. Consumer purchases also play a role in helping people express certain aspects of their personality and social status. And it is this idea that personality can be expressed through products that interests the advertisement and marketing industry.

Personality

Psychologists say there are six major traits that differentiate the personality of human minds.

A century of psychology has identified six major dimensions of variation that predict human behavior and that are salient to us. These are the key individual differences that distinguish human minds. These are mental traits that can be measured with good reliability and validity, that are genetically heritable, and stable across the life span, that predict behavior across diverse settings and domains, (school, work, leisure, consumption, and family life), and that seem to be universal across cultures and even across many animal species. [1]

Identified with the acronym, **GOCASE**, each letter represents a different trait. **G** represents general intelligence, **O** represents openness to experience, **C** is for conscientiousness and self-control, **A** is for agreeableness and kindness, **S** is for stability in emotion, and **E** is for extraversion. Conceivably, if you have an ability to understand a person based on those traits, you will have a good idea about how they will behave in different circumstances. Marketers have concerned themselves with selling products to people by appealing to these personality traits.

Propaganda

The propagandist must treat personality as he would treat any other objective fact within his province.

— Edward Bernays [2]

Propaganda is used to sell products just as it is to galvanize mass consensus around political viewpoints, and as Edward Bernays will argue, "... such organization and focusing are necessary to orderly life." After World War II, the term took on a more sinister meaning due to the Nazi's considerable and effective use of design and media for propagandistic and tragic ends. Edward Bernays, considered the father of public relations (a term synonymous with advertising and propaganda), authored a book in 1928 aptly named, *Propaganda*. Bernays, Sigmund Freud's nephew, applied Freudian ideas of unconscious desire for selling products and manipulation of mass opinion, inventing techniques that are in standard use today by politicians and corporations. In the opening paragraph of *Propaganda*, Bernays writes, "The conscious and intelligent manipulation of the organized habits and opinions of the masses is an important element in a democratic society. Those who manipulate this unseen mechanism of society constitute an invisible government which is the ruling power of our country." Bernays did not believe that a democratic society could be left to run itself without propaganda and that daily life would be otherwise too burdensome. He could not have predicted the impact of technology like the Internet, which provides near instantaneous access to multiple political viewpoints, fact-checking, product reviews, and other information which simultaneously undermines and expands the influence of propaganda on an individual.

One effective way that propaganda is designed is through framing. A frame manipulates how a person thinks about something, typically by helping them come to either a negative or positive judgement. This is the primary function of American political commentators, who interpret an event through a frame to support a liberal or conservative rhetoric.

What is identity?

Identity is the concept of ourselves, the concept presented to others (your brand), and the concept others have of us. Identity can scale from a single person to an entire nation. Identification is an essential process for human decision making. Differentiating between safe or dangerous is one of the first things humans do unconsciously, and this process is typically based on patterns of the familiar. This plays a core role in identity politics, typically resulting in exclusion or separation of people—and by extension contributes to bigotry and ignorance according to a wide variety of physical or social attributes. What is an identity for a person? Tim Urban explores this question on his blog, *Wait But Why*, in a post entitled, [What Makes You, You?](#) The post is a summary of various models used to understand what identity might be and why it's so hard to pin down.

Brand identity

Branding is the narrative that presents the story of a person, company, product, service, or organization to others. Brands are supposed to help people make choices, and reassure them that they made the correct one at a time where products are saturated with competition. Branding is therefore a kind of propaganda for impression management, constructing the identity of a company or person to more easily sell products, ideas, or concepts.

The "tyranny of choice" is a popular expression that refers to when the overabundance of options paralyzes a person's ability to choose. W. E. Hick published "On the Rate of Gain of Information" in the *Quarterly Journal of Experimental Psychology* in 1952, and subsequently Hick's Law was formed. Hick's Law is a mathematical formula used to estimate the amount of time it will take a person to make a decision. It states that the amount of time required to make a decision is a function of the amount of options available. When selling products, branding is used to help a person make those decisions faster. For simple operations, awareness of Hick's Law will help designers better understand how to make an interaction for their users more efficient.

A good example of the "tyranny of choice" can be experienced in the American supermarket. For this example, let's consider which toothbrush to buy, for me a stressful task that never feels gratifying. Some questions I ask while shopping are: which toothbrush has the most effective bristle pattern? Which bristle hardness is the right hardness? Which will cause the least harm to the environment? Which will last the longest before the need to buy another one? Does the value-pack of four toothbrushes make financial sense? Are there reviews that can help me decide? Maybe I should try that sonic thing that shoots sound-waves at my teeth. Why does the eco-friendly bamboo toothbrush cost twice as much though it looks like it will do half as good a job at cleaning? I typically spend 20 minutes in the aisle trying to figure out which option is best option before I give up and purchase the same kind of toothbrush I have been using for the last decade.

Good branding will communicate the product's attributes and benefits to a person who has corresponding values to help them choose that product, and will help the consumer feel that they've made the right choice. Buyer's remorse is when someone has regret after buying something, often because they prioritized incorrectly, they didn't spend enough time thinking about their choice, or the product's branding was somehow dishonest.

In corporate branding, the market drives brand identity design for the purpose of attracting customers, clients, suppliers, investors, and other stakeholders. Branding can help a company to promote a kind of historical heritage, disruptive newness, or another set of values in order to appeal to a target market. Logos, word-marks, letterhead, packaging, architecture, corporate culture, product aesthetics, social impact, and leadership personalities all contribute to the brand identity.

Citations

1. Miller, Geoffrey. Spent: Sex, Evolution, and Consumer Behavior. 2009. Page 144
2. Bernays, Edward. Propaganda. 1928

Ritual Project



Brief

For this project, you will be designing a set of rules and procedures for a ritual experience, and producing a prototype experience for another person to perform.

A ritual is a designed experience that combines habits and routine with **symbolism**, ultimately producing an event or moment that has meaning. Rituals are intended to be specially-designed events that provide opportunities for reflection, celebration, connectivity, behavioral nudging, focus, reinforcement, and more. An example of a small or humble ritual could be a group of friends who have lunch together every week or a busy professional who writes reflective journal entries at the end of the day. Larger, more prestigious rituals include graduation ceremonies, weddings, and organized sporting events like football and baseball. Small rituals tend to not require many resources, are relatively inexpensive, and occur more frequently than larger rituals, some of which may only be experienced once in a lifetime.

A ritual is an interesting design problem because it is produced for the purpose of **disrupting the flow of everyday concerns** to bring about new perspective. This is counter to the way we typically think about design – as something that you wouldn't notice if it is done well.

Philosopher Alison Gopnik writes that "passing on rituals seems to be as important in cultural evolution as passing on technologies. In fact, you might argue that rituals *are* technologies. But they're **social technologies** instead of physical ones."

In her book *The Gardener and the Carpenter*, Gopnik describes how rituals relate to identity:

"Human beings engage in rituals, from Sunday morning football to afternoon tea service to midnight mass. Rituals are actions that make little sense by themselves but serve important social functions. By performing very specific actions in a **highly prescribed** way, you can identify who you are or what group you belong to."

In fact, you can actually become a different kind of person by engaging in the right ritual. I became a wife by doing a bunch of elaborate things with rings and wearing a funny dress; I became a Ph.D. by walking slowly down a long aisle in an impressive Christopher Wren building in Oxford and being tapped on the head by a man in a funny dress. (Funny dresses seem to play an especially important role in rituals.)

The whole point of rituals is that they don't make ordinary casual sense. They are potent precisely because they're **divorced from ordinary principles of efficiency**... (I once made the grave mistake of attending a Japanese tea ceremony when I was thirsty and wanted tea—the ritualized beauty of the proceedings is much easier to appreciate when you're not counting on a useful causal outcome.)"

Designing a ritual

This project asks you to go through a variety of design phases. The first discovery phase asks you to conduct an observation. From there, you will pull out themes and insights, develop a "How might we" question, develop ideas as a group, create and test prototypes, and produce a designed experience. Solutions to this project brief should strive for experimental rituals that ask or nudge people to change their behavior in some way, and creatively explore identified themes.

Your project must contain elements of novelty and does NOT need to solve a literal problem.

Inspiration

- [Sen no Rikyu, The Great Master of Japanese Tea Ceremony](#)
- [Introducing Ritual Design: meaning, purpose, and behavior change](#)
- [Sol LeWitt](#)
- [RFID Ceramic Dinnerware - Cups](#) By Candice Ng

Requirements

- Follow a prescribed design process to develop a ritual experience.
 - The project must have visual or physical props that you create to aid the ritual experience.
-

1. Image generated by MidJourney using prompt: coffee cup :: water color painting --ar 16:9



Discover: Object observation

Field research is a central part of the human-centered design process. You will practice field research by finding and recording objects in the environment. The purpose of this step is to practice better observational skills, to help you notice and that which is typically taken for granted, and to start thinking about objects and people as part of a larger system of a designed environment.

Materials

1. Journal
2. Pencil or pen, and/or marker

Instructions

Step 1: Observe and record

1. Go outside or inside of a building and identify a group of objects that repeat themselves. They do not have to be exactly the same, but should be similar, or in the same category or genre of object. The object can be of any scale, and does not necessarily have to be 'bodied' (for instance, a shadow can be an object).
2. In your journal, make a sketch of the object(s) from multiple angles if necessary.
3. Write down everything you can notice. This may include:
 - Record location, time of day, and date of observation
 - Describe its shape
 - What is it made from?
 - Where does it live?
 - Who put it there and why?
 - Does it move or is it otherwise affected by its environment?
 - What are the purposes of this object, and how does it serve its purpose?
 - List attributes like color and weight.
 - Do people interact with it? If so how, and why, when, and where?
 - How is/are it/they similar or different from the objects around it/them?
 - Does it influence sound in some way?

- What else do you notice about the object or its context in space?

Example object

If you sat down in a coffee shop for a few minutes trying to identify objects that seem to reoccur, you might notice that there are many paper cups. You might then notice that these paper cups have a particular role in the coffee shop, and circulate throughout the space in a particular way. The paper cup would therefore make a good subject for the focus of the observation.

Step 2: Document and post your work

Please pay careful attention to file formats.

1. Submit a clear, unobstructed, well lit, readable, properly oriented and straight, high resolution scan or photograph of your journal notes in .jpg or .png format.
2. Post a few sentences describing where you went and what object you observed.



Define: Word pairs

Now that you've finished conducting the observation, it's time to start exploring possible directions for the project. This step is important to help focus the How Might We question that will drive the rest of the project's direction.

Materials

- Pen or pencil
- Journal

Instructions

1. Re-read your observations.
2. In your journal, write "**Ritual project: Word pairs...**" at the top of the page.
3. Write at minimum three sentences using the following formula that explain what the object is for: "**name of the object** is for the purpose of **purpose verb or noun**." The purpose verb or noun will be known at the "purpose word."
4. Lower on the page, write word-pairs at the top. Identify and write a minimum of three word-pairs by matching the purpose (the words from the end of your sentences) to the focus word, "**intervention**."
 - o For example, let's say that the object is a **bed**. A bed could be used for the purpose of sleeping, so "*sleeping-intervention*" is the word pair that you would generate. A bed could also be used for many other things like studying, healing from illness or injury, hiding from monsters (in the case of a child), or more generally supporting a state of comfort or rest. You could then generate word pairs like "*learning-intervention*," "*healing-intervention*," "*saftey-intervention*," and "*comfort-intervention*." The word pairs should not be too specific or too broad. For instance, instead of sleep, you could write "*rem cycles*," which would not allow you much room to conceptualize ideas in the following steps. You could also write "*living*" instead of sleeping, as it is a requirement for humans to live, however, this would be so broad that it would be challenging to narrow down ideas. These should be universal experiences as much as possible.

Post work

Use the file format indicated in each step. You must obtain prior approval to deviate from these upload requirements. Please check that your work has uploaded properly.

1. Check that you have written a minimum of three purpose statements.
2. Check that you have written a minimum of three word-pairs.
3. Submit a clear, unobstructed, well lit, readable, properly oriented and straight, high resolution scan or photograph of your journal notes in .jpg or .png format.



Discover: Interview

In this step, you will conduct field research once again by interviewing a person who will become your target user.

Materials

1. Journal
2. Pencil or pen
3. Access to a communication device (computer or phone)

Instructions guide

Step 1: Interview Setup

You should have been assigned a project partner to interview. The purpose of this interview is to discover opportunities for design interventions. To help guide the design of the intervention, you will need to learn more about your partner. If you intend to record the interview (not required) you must obtain the permission of the interviewee.

Step 2: Find opportunities for intervention

Start the interview by asking your participant about their daily routine. Try to find something they do or experience every day that they find distracting, challenging, frustrating, stressful, or something they wish they didn't have to do.

Interview Tip: Try to have a natural conversation. Laugh, joke, and don't rely solely on the example questions below. Give your subject plenty of time to respond as awkward pauses may result in valuable responses if you're patient.

Generate questions and document responses

Select one of the interventions from the pair-words step. Use the original 'purpose word' (IE - sleep, safety, comfort, etc. from the examples). Focus on this word for the interview. If the person you are interviewing has trouble answering your questions, consider changing your selected word.

I want you to think about *insert the 'purpose word' you have selected.*

Example questions:

The purpose word you have to work with will significantly impact the following question structures, but use it as a guide to generate your own interview questions. Please ask a minimum of 8 interview questions.

1. Can you tell me about your relationship with *purpose word*? What does it mean to you?
2. When is the last time you interacted with; performed; experienced *purpose word*?
3. Do you find *purpose word* particularly challenging or elusive?
 - i. Do you have any reoccurring frustrations or elations?
4. If you could change something about your relationship with *purpose word*, what would it be? Why is that? Can you elaborate? ("it" should be a specific thing, see **Laddering - Five 'Why?'s**)
5. Do you value *purpose word*? Why do you think that is?
6. Do you think about *purpose word* in your daily life? If yes/no, do you think you should be considering it more/less often? Why do/don't you?

Original Questions

Prepare two or more original questions that you will ask your subject.

1. _____?
2. _____?

Laddering - Five 'Why?'s

Laddering is a technique developed in the 1960s to help clinical psychologists uncover core values and beliefs. If your participant has many responses from the previous step, focus on one response. Ask your participant **why**. Asking why helps us to better understand an ambiguous issue and gets to a more emotional aspect of a problem. After they respond, ask why again. Repeat this until you have asked why five times. Asking five times is important because core issues will start to emerge around four or five levels deep. Ask about their responses specifically to avoid horizontal questions. For example, "Why else didn't you get your homework done?" is a horizontal question. "Why didn't you have enough time to complete the assignment?" is a deeper question.

Step 3: Recording responses

- Record the interviewee's responses in your journal. You don't need to write everything they say. Try to capture the key insights.
- Make a note of any responses that led to a deeper understanding of what motivates this person?
- The interview is about better understanding opportunities to build in intervention experiences. Try not to make reference to the project during the questions that may lead the interviewee to attempt to think of ideas rather than giving honest answers.

Instructions

1. Set up the interview
2. Ask questions to find key issue(s)
3. Record the interviewee's responses in your journal

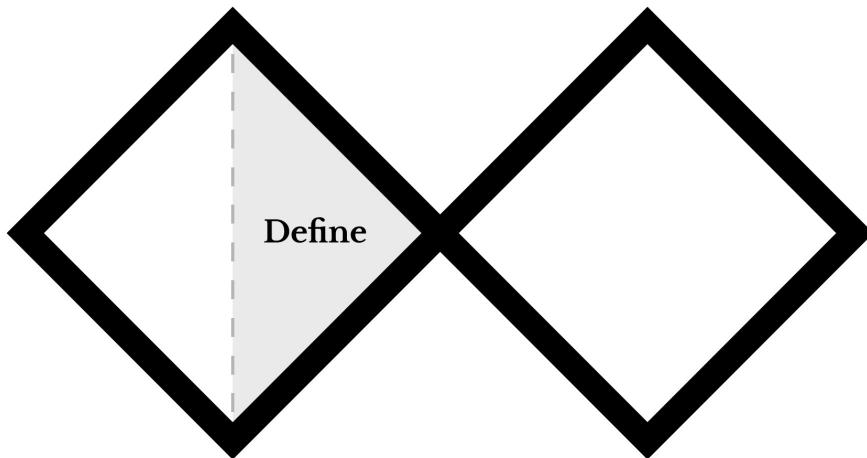
Post work

Use the file format indicated in each step. You must obtain prior approval to deviate from these upload requirements. Please check that your work has uploaded properly.

1. Submit an image of your journal notes in .jpg or .png format.

References

Adapted from: <http://www.designkit.org/methods/66>



Define: Themes and insights

Now that you've finished conducting the interview, it's time to identify some themes and general insights. This step is an important to help focus the How Might We question that will drive the rest of the project's direction.

Materials

- Pen or pencil
- Journal

Instructions

1. Re-read your interview questions and answers.
2. In your journal, write "**themes**" at the top of the page. Write down your answers as single words or very short statements to the following questions:
 - i. What patterns did you notice? For example, "routinely late for class."
 - ii. Did anything surprise you?
 - iii. Was there anything amusing or disheartening?
 - iv. What else was significant or meaningful?
3. On the following page in your journal, write "**core insights**" at the top. You may need to use more than one page to write all three insights. Each insight contains three sentences. Using your themes from the previous journal page, write three insights by using the following pattern for each insight:
 - **Positive state or event:** "Going camping forces Mike to be active and getting away from technology makes him feel great."
 - **Specific dilemma:** "But he works a lot and forgets to plan trips. Getting ready for trips takes so much effort, that he doesn't have time or energy to plan and pack at the last minute, and doesn't go very often."
 - **Desired End State:** "I wish there was a way to help Mike plan and prepare trips."
4. Document your themes and insights with a photograph or scan.

Post work to the Studio

Use the file format indicated in each step. You must obtain prior approval to deviate from these upload requirements. Please check that your work has uploaded properly.

1. Check that you identified a variety of themes.
 2. Check that you wrote three (3) full core insights using the provided pattern in the instructions. A single insight includes three sentences, so you will have nine (9) total sentences if you've followed the instructions precisely.
 3. Upload the photograph or scan of your themes and insights in .jpg or .png format.
-

Adapted from <http://www.designkit.org/methods/62> and <http://www.designkit.org/methods/5>



Define: How Might We ...?

A "How might we" (HMW) question is both an insight about what the core issue is as well as a focus aid for the design process. This question will serve as inspiration during the development and delivery phases of the project. If your development strays too far from the HMW question, the solution you deliver might be solving a different set of issues from the ones you set out to solve. Refer back to the HMW question often throughout the process.

Use the following pattern for creating the sentence: How might we (**positive action**) (**a description of specific challenge**) (**a specific context**) ?

Materials

- Pen or pencil
- Journal

Example Question

In this example, let's say that I discovered that a friend was anxious about socializing. The HMW question could be phrased like this:

How might we (**relieve the stress of social interaction from**) (**a person who has trouble feeling comfortable in groups**) (**when they socialize with friends**) ?

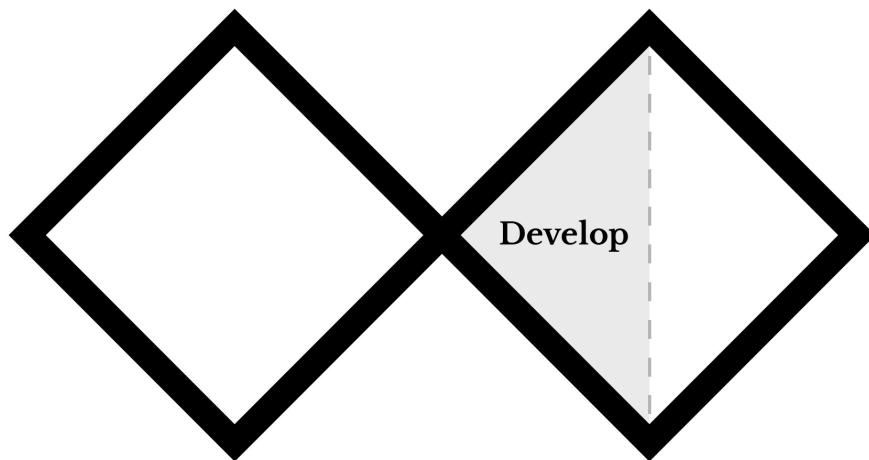
Instructions

1. Based on your interview insights, use the sentence template to write three possible HMW questions, one for each insight.
2. Review your sentences and **circle** the one you think works best.
3. Document your HMW question with a photograph or scan.

Post work to the Studio

Use the file format indicated in each step. You must obtain prior approval to deviate from these upload requirements. Please check that your work has uploaded properly.

1. Upload the photograph or scan of your HMW questions in `.jpg` or `.png` format.



Develop: Brainstorm and Journey Map

Now that you have a How Might We question, it's time to brainstorm some ideas to try to solve for the question. Generating ideas by yourself can be fairly difficult if you are new to this process. Even experienced designers benefit from working in groups because typically the array of ideas generated in a discussion is far larger than when working alone. For this step, you will partner up with small groups to brainstorm ideas for each person's project.

After you complete the brainstorm, you will work individually on developing a journey map to explore one of the ideas from the brainstorm. You will start to design the experience at a high level, almost like developing the plot to a movie. You do not need to have every detail of the experience and actions figured out in the journey map, but it should explain the idea from the brainstorm at a high level.

A journey map should include the following components

1. A critical pathway of core moments/events
2. Feelings and thoughts that might be important to note about the events
3. What decisions are made that lead to the events
4. Any opportunities to capture outcomes through media production (reading, writing, video, drawing, photos, sculptures, etc.)



Tools

- Sign up for Mural.co as a part of the Penn State Mral group, link in Canvas.
- [Mural.co Template](#): After you have created an account and logged in, click on "create mural from this template."

Time

30 - 60 minutes

Instructions

1. In Step 1 on the Mural template, complete the brainstorming exercise with two or three other people. If you are not in the same room, please email the links to each other's Mural. Each person will have their own Mural with their own HMW question selected. Organize ideas into the **play** and **reflection** categories. Spend 15 minutes for each person's How Might We question so that every person in the group has their own Mural template and brainstormed ideas.
2. You will complete the journey map in step 2 by yourself. First write down core moment(s) of engagement in the squares. **For example:** "I realized the grass was too long." Try to identify as many as you can. Consider what the most critical aspects of what the experience might be, and what the person is thinking and feeling at the moment, marked with circles.

Post work

1. Export and download the Mural as a PDF and then upload that PDF to Canvas.

Citation

Adapted from: <http://www.designkit.org/methods/63>

Develop: Prototype