

DIGITAL MULTIMEDIA DESIGN

Foundations



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DMD 100: Digital Multimedia Design Foundations

DMD 100 is the first of three spine courses in the Bachelor of Design in Digital Multimedia Design (DMD) program at Penn State University. This program is the [first entirely online multi-college undergraduate bachelor's degree program](#) offered at Penn State.

Visit the [DMD Program Hub](#) for more details.

Downloads

Desktop background art

[PNG - 2880x1800: \(8.12MB\)](#)

[dmd-100-desktop-bg.png](#)

Contributors

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- Graeme Sullivan, Director of the Penn State School of Visual Arts, for the inspiring conversations, book recommendations, and unwavering moral support;
- Linda Collins, for proofreading over 200 pages.

Contributing

Anyone can recommend additions or alterations to this course. Please, submit a [pull request on github.com](#) or file an issue in the [issue queue](#).

License

See the [license](#) page for details.

About this course

DMD 100: Digital Multimedia Design Foundations introduces design process and thinking skills to support and facilitate creative and reasoned approaches to ambiguous and ill-defined problem spaces. It introduces concepts, skills, language, and principles of practice related to art and design, communications, and information sciences — three discreet disciplines in which students can pursue further study while developing their learning pathways. With the aid of a standard design process, we walk through methods, tools, and mental attitudes necessary to approach ambiguous problems. This course is not meant to be a comprehensive design process catalog, and instead should inspire and build confidence in the act of design. The concept of "design" for DMD students is a frame through which complex issues can be discovered and defined and solutions can be best developed and delivered.

Course Structure

DMD 100 is comprised of five lessons that introduce design topics, approaches, and considerations. Each lesson will span one to four weeks depending on the semester. Students will read assigned chapters and course pages, review supplemental media including podcasts and videos, and complete design exercises employing the double-diamond method, culminating in a lesson project and critique. Students are expected to practice the design process throughout the course, and therefore will be assigned several activities a week to provide opportunity for practice and [iteration](#).

Digital course technology

A course is not software or a website, but rather the delivery of pedagogy for particular subject matter over a set period of time. Without getting too far into learning theory, you can think of pedagogy as the todo list that an instructor gives students in order to meaningfully engage with and learn course content.

Delivering pedagogy online has its own set of challenges. We'll be using a mix of online software to meet the needs of this online course. [Canvas](#) is a Learning Management System (LMS) that stores the assignment calendar, grades, and provides an easy way to send messages to everyone in the course. We host the core course text and image-based content in ELMS Learning Network, which is similar to an LMS, but with some custom in-house built tools. One such tool is the Studio, which allows students to more easily share project progress with each other. You will be guided to perform actions through a combination of the Canvas calendar, emails, and explicit assignment instructions. Contact your course instructor via Penn State E-Mail if you are ever confused. It is your responsibility as a student to know when assignments are due.

Technical and material requirements

Hardware

1. **Computer:** This fully online course will require access to a computer that meets the minimum requirements set by World Campus.
2. **Internet:** You will need broadband Internet to view videos and other media content.
3. **Camera or cellphone camera:** You will be asked to document various aspects of your work
4. **Printer/scanner:** A printer will be helpful for printing out paper templates. A scanner is optional, but would be helpful.

Software

1. Web browser: You will need to have the latest version of either Google Chrome, Safari, Firefox, or Microsoft Edge.
2. Accounts: In addition to general University account access, you will be required to create an account with [InvisionApp.com](#)
3. Software installs: You will need to download and install an open-source desktop application called Twine from [Twinery.org](#). It is possible to use a web version of this software if you cannot or wish not to install it on your computer.

Materials

1. Journal

- Any journal is fine. I recommend the Moleskine Cahier Journal, Large, Squared, Kraft Brown, Soft Cover (5 x 8.25) [Amazon purchase link](#)

2. Pens, pencils, markers

- Any that you already own are fine, you do not need to purchase special ones for this course. However, the following recommendations are professional grade if you are so inclined to invest in quality drawing tools.

- Pencil: Palomino Blackwing 602
- Pen: Copic Multiliner Marker 0.5 - Black
- Marker: Copic N2

3. Scissors

4. Post-it Notes

5. Poster board (or large open wall space) for the post-its

Book

We will be reading *Design and Truth* by Robert Grudin. You will need to purchase a copy of this book. Students get free [Amazon Prime shipping](#).

Course author



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This course was written in Michael Collins joined the Penn State School of Visual Arts in 2012 where he teaches 3D animation, digital design, and digital fabrication. He is the Lead Faculty Coordinator for the Digital Multimedia Design program and is the primary course author for DMD 100. His research interests in open-source technology and sustainable design unite around online education, where he works to identify and solve contemporary issues facing online teaching and learning. Long-term project collaborations include the ELM S Learning Network project and the OERSchema project. Michael has previously worked on projects for the NFL, BMW Guggenheim

Lab in NYC, worked as freelance product designer, and runs an online furniture design company. He has attended, presented at, and helped organize a variety of international design, technology, and education conferences and has been a long-time SIGGRAPH subcommittee volunteer.

Digital Multimedia Design

For up-to-date information, visit the [DMD Program Hub](#).

Background

Design is now a relevant force in science, art, business, politics, technology, humanities, and other traditionally siloed fields. Admittedly, this means that deciding how and what to teach a designer in a multi-domain program becomes a rather daunting task. On July 01, 2012, Penn State University suspended a program called Science, Technology, and Society (STS)—an event embroiled in [controversy](#)—just as [Harvard](#) initiated their own STS program. [1] Content of Penn State STS courses included historical contexts for technological, scientific, and social progress through history. These topics are relevant to design because STS subject-matter is a deep-dive into the visible and invisible forces that shape design decisions, and consequently, the impacts of those design decisions on society. The Digital Multimedia Design program intends to bring some of that important context into the curriculum, though it is not intended to (and simply could not hope to) replace supplemental studies into the STS field.

As you move through your academic career, you can and should explore aspects of design that you find exciting and fulfilling. A maker bears a responsibility to know the implications of their work and how other people are ultimately affected. In this degree program, you will examine design as it relates to digital tools and skills needed for storytelling, products and artifacts, interaction and experiences, and the production and dissemination of knowledge.

DMD 100: Digital Multimedia Design Foundations will expose you to a broad design perspective so that you can apply it as a conceptual *frame* for your studies. In other words, even though you will be studying content not specifically talking about design, you will be able to understand the relationship between what you are learning and the larger context of design. After you complete DMD 100 and other prescribed courses, you will enroll in other courses that will help develop digital production skills, build awareness to contemporary issues, and locate historical context. Once you have explored relevant subject matter in other courses, you will be ready to rejoin the DMD major courses to synthesize your interests and skills into projects.

In **DMD 300: Digital Multimedia Design Studio**, you will apply your experiences from previous coursework to narrow your focus while producing projects in collaboration with your peers. **DMD 400: Digital Multimedia Design Capstone** is the capstone course in which you will create an entirely self-directed design project for inclusion in an online thesis project exhibition.

Mission

The Digital Multimedia Design Program promotes the values of imagination and creativity as human resources. **Digital** media generally refers to the storage and transmission of information in increasingly varied **multimedia** digital formats and devices, and within a changing array of modes of communication. **Design** is a means by which we respond to change in a purposeful way. By focusing on critical issues and opportunities, designers develop plans for taking innovative and strategic actions. Hence, digital design shapes and impacts the physical and virtual spaces people inhabit. Over the course of this program, you will produce projects that stimulate sound habits of mind, develop proficiencies of practice, and foster critical sensibilities for addressing issues.

DMD Core

The program is comprised of three program-exclusive spine courses and six prescribed (required) "core" courses – two from each contributing college: Arts & Architecture, Communications, and Information Sciences & Technology. The core courses will provide skills and context pertinent to the disciplines from which they reside. The spine courses provide opportunities to frame and combine experiences from these disciplines.

Pathways

Though design is part of the core identity of the program, each student will develop their own pathway. A pathway is literally a sequence of courses. However, you have great control over choosing which courses to combine into your sequence. To help you get started, there are pre-made course sequences available on the [DMD Program Hub \(dmd.psu.edu\)](#).

Projects

You will develop capabilities necessary to use digital technologies in multimedia projects in prescribed, supporting, and additional courses. DMD 100 projects are designed for students with limited knowledge of digital production technology, but introduces foundational design knowledge that can be applied to all future DMD coursework. Final projects in the capstone course will be made available as part of portfolios and an online exhibition.

Portfolios

Developing a creative digital portfolio of work that showcases your interest areas and capabilities will become an essential component for professional development. More information on portfolios will become available on the DMD Program Hub website.

Citation

1. <https://installingorder.org/2013/03/27/sts-program-at-penn-state/>

Course instructor



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Michael Collins joined the Penn State School of Visual Arts in 2012 where he teaches 3D animation, digital design, and digital fabrication. He is the Lead Faculty Coordinator for the Digital Multimedia Design program and is the primary course author for DMD 100. His research interests in open-source technology and sustainable design unite around online education, where he works to identify

and solve contemporary issues facing online teaching and learning. Long-term project collaborations include the ELMS Learning Network project and the OERSchema project. Michael has previously worked on projects for the NFL, BMW Guggenheim Lab in NYC, and as freelance product designer. He has attended, presented at, and helped organize a variety of international design, technology, and education conferences and has been a long-time SIGGRAPH subcommittee volunteer.

Measuring success

To measure success in a way that we can compare one to another, we must have a common understanding about what we mean by success and what we mean by measurement. Some key requirements of achieving success are not overtly teachable, measurable, or relevant for everyone. Determining what success looks like is difficult, as the qualities of a successful student can be different in given contexts. Therefore, to have a universal measurement system that works to any degree of accuracy often means that objective and quantifiable metrics are chosen over subjective and qualitative metrics – and the former of which may be poor indicators of success for a multifaceted design program. In other words, the nature of real learning limits what we can reasonably measure.

In many educational institutions, the grade point average (GPA) measures a student's ability to meet the success metrics as set by an instructor or governing assessment entity. There may be some correlation between GPA and success post graduation, but a high GPA does not guarantee a person will get a job or start a business, become well-rounded, or be prepared for the unexpected challenges ahead. A student's attitude and grit are the best indications of success after graduation.

I have assembled a list that attempts to describe the attitudes and attributes that are likely to indicate success:

1. Adaptability
 - Shift mental models to approach problems differently
 - Rapidly identify and learn required knowledge
 - Don't be too adaptable
2. Understanding
 - Explore a wide array of perspectives
 - Deconstruct complexity into less complex parts
 - Contextualize issues within larger systems
 - Be curious
 - Don't take feedback personally or at face value
3. Focus
 - Prioritize essential tasks
 - Be aware of capabilities and limitations
 - Identify and clear away distractions
4. Perseverance (grit)
 - Don't give up; do what you can with what you have
 - Dedicate time and energy
 - Finish what you start
 - Practice unwavering optimism (self-efficacy)
 - Fail fast to eventually succeed
5. Skill
 - Develop intellectual capabilities
 - Achieve technical mastery
 - Communicate appropriately with respective audiences
6. Empathy
 - Put yourself in someone's shoes to better understand why we design
 - Talk to people you want to design for
 - Listen, question, and defer judgement

Learning Objectives

Students completing DMD 100: Digital Multimedia Design Foundations will be able to do the following:

- 1. Objectives related to developing Process and Procedural Skills (Designing)**
 - i. Integrate skills, knowledge, and creative practices in digital media in exploratory exercises that draw on content and methods from information sciences and technology, communications, and visual arts and design.
 - ii. Use digital technologies in multimedia projects through exploration, expression, and communication that engage a multiplicity of ideas, forms, actions, and settings.
 - iii. Gather and analyze information from research sources to identify and apply relevant content that can aid concept development, improve design processes and products.
- 2. Objectives related to developing Critical Skills (Critiquing)**
 - i. Adapt an interdisciplinary vocabulary of terms, methods, and processes to review applying information and critique ideas in individual contexts and collaborative settings
 - ii. Demonstrate communication skills by creating and presenting ideas, concepts, and designs in written, verbal, and visual forms.
 - iii. Implement new ideas and develop a diverse array of options for problem solving in response to critical review and the iterative design process for improving work.
- 3. Objectives related to developing Attitudes and Awareness (Assessing context)**
 - i. Recognize how influences, constraints, personal interests, ethics, and resources impact design decisions and creative options.

Projects

DMD 100 has three projects, one in user experience and interface prototyping, interactive storytelling, and open product design. These are difficult projects and have been divided into achievable deliverables that follow the Double Diamond design process.

Submitting projects

When project tasks are completed, they are submitted to [ELM SLN Studio](#). This class-wide, virtual space displays your work along with that of your peers — mimicking a physical art or design studio environment.

Feedback and critique

Feedback can come in various forms, including advice, compliments, ambiguous remarks, big picture insights, etc. Learn how to listen carefully and diligently to what is being said so you can translate the feedback to be understandable, useful, and ultimately actionable. If someone gives you ambiguous feedback, this means that they can intuitively see a weakness but might not know why something isn't working. You should follow up with their comments with probing questions to better understand their perspective.

If an instructor gives you advice and that they want you to do something, you should try it and see if it works. If it doesn't work well, then bring that up in the next critique. The instructor is not responsible for the choices you make when creating work, only for guiding and responding to those choices. If you make work that is sub-par as a result of the instructor asking you to try something, don't blame the instructor. You should have the ability to identify emergent weaknesses that the instructor did not anticipate, and pivot before showing that work in the next critique.

Interpreting feedback

Let's say you just pulled an all-nighter to get a project finished (unfortunately very common for art and design students). It's a masterpiece, and you can't wait to unveil it to unfettered acclaim from your peers. However, you show your work to everyone, and the response you get does not sound like praise. In fact, they say things like "it's not working" or "I don't understand why you did that ..." and you are devastated.

Unless you had brutally honest parents growing up, you might not be used to a negative response to your creative work, particularly work in which you have invested considerable effort. Letting go of emotional attachment to your work will greatly help you with the ability to self-evaluate more objectively. That "eye" that people mention that perhaps got you into the field in the first place comes from this ability to objectively evaluate. Praise can certainly happen in feedback or critique and is a great way to communicate when you've done something well, but you should remain skeptical of too much praise. Unwarranted praise can really hold your work back, blinding you from where your weaknesses lie. If your work needs improvement, you need to know about it in order to improve, and this is the main goal of feedback.

Though feedback typically centers on your work, sometimes comments are aimed at you and not your work. The emotional trauma of being criticized can be painful. Step back and remind yourself that the purpose of the feedback is to help and encourage you, not to be condescending or cruel. This objectivity is really important so that you can learn from the feedback. Some students have trouble trying anything outside of their comfort zone. This is often obvious in a feedback session or critique. Signs include defensiveness to negative feedback, sense of arrogance or overconfidence, dismissal of instructor comments or suggestions, and outright refusal to make changes according to feedback. This is not a professional attitude or outlook, and will keep you from the opportunities that will grow you as an artist or designer. Failure must happen rapidly so you can improve at a quick pace. Closed-mindedness causes failure to happen slowly over a long period of time. Your instructors are genuinely invested in your success and it is their job to point out shortcomings. Most student interpretations of overt "insensitivity" or "hardness" by an instructor typically results from a situation such as the one described.

Giving feedback

Keep it positive. A tried and true technique for feedback, where appropriate, is called the "critique sandwich." This is the Happy Meal of the critique process. Essentially, you will start and end a critique with positive comments (the bread), using the comments in between (the meat or meat-flavored tofu) for the important, possibly negative-sounding feedback. This makes hard-to-swallow comments more palatable, yet still communicates the important issues.

Trolling

Anyone can intentionally or unintentionally become a troll. A troll is a person who is intent on disrupting constructive discussion by posting inflammatory remarks to halt the progress of a discussion — typically for the purpose of self-amusement or for the emotional high of winning an argument. This happens in online (and sometimes offline) spaces that lack established social norms or policy enforcement.

In an academic setting, the instructor sets the social norms of the classroom and maintains authority over moderating a discussion. It is not an instructor's job to be "thought police." Therefore, if a student has an opinion that is counter to the general opinions of the class, voicing those opinions are encouraged to provoke thoughtful discussion. However, disrespectful remarks meant to oppress another student will be considered trolling behavior and will not be allowed to continue without consequence.

Trolling is the antithetical to meaningful discussion and learning, so try to be mindful that your remarks (possibly being written under some emotional stress) don't accidentally veer off course and shut down a potentially helpful conversation.



Technology

Keep your data safe

Conspiring forces are working right now to destroy your data. The hard drives that data is stored on are only meant to last for a limited amount of time, and they will eventually stop working. Flash storage has made it easy to store data onto tiny objects that are nearly impossible not to lose. Yet another zero-day vulnerability has been found for your operating system that a 12 year old is exploiting to encrypt your hard drive to sell your data back to you — for which you will have to pay with a lot of BitCoins. Your cat is about to knock a glass of water onto your laptop, frying your motherboard. Your dog is about to knock your computer off of the bed. Your kid is two minutes away from holding a magnet too close to your hard disk. Some dude just takes your computer while you were picking up your latte.

Right before your project is due, your computer will fail. It might not be this semester and it might not be next semester, but you should act as if it will happen this semester and next semester. Be paranoid. Backup your data in multiple places.

You should now feel appropriately uncomfortable if your computer's data has never been backed up.

Backing up your data

Please purchase a dedicated back-up hard drive. Cloud backups like Google Drive and Dropbox, while wonderful, are not completely infallible on their own. The only way to ensure that your files are safe is to perform daily backups to an external hard drive and to backup to a third location. Please practice safe and redundant data storage.

Security recommendations (not required, but a good idea)

These practices and software are at your own risk. These recommendations are not supported by the course author, instructor, or other learning staff in any way.

1. Use a password manager: [1Password](#) or [LastPass](#)

2. 2FA - [Enable Two-Factor Authentication for your PSU account](#)
3. VPN Encryption - A service like [Private Internet Access](#) will help keep you protected while using the Internet at airports and coffee shops. Penn State also [provides VPN](#) to select services.
4. Disk encryption - Wise, but also time consuming to run for the first time (up to 3 days to fully finish on some computers) and if you forget your password you will not be able to access your data.
5. Update your Operating System on your computer and Phone as soon as updates are released for security vulnerabilities.

Writing Guidelines

"Don't make the reader do the thinking you failed to do."

Drafts

When writing a draft, composition structure, grammar, and spelling are the least important. While it is always good to strive for perfection, that should be relegated to the editing phase of writing. A good drafting session means that you were able to get as many of your ideas out as rapidly as possible, even if they are fragments or tangents. Natural language is fine in this stage, and even desired for personal stories. When providing feedback on drafts, try not to nitpick on spelling and grammar, but rather the content, insights, and direction of the concepts.

Final deliverables

Typically, a final deliverable will be evaluated according to all possible metrics. Ensure that you leave time for editing — this will help you catch embarrassing spelling and grammar [errors](#). You should always ask someone to give you feedback on your writing and to proofread before you submit. This will help you communicate your ideas free from the distraction of careless mistakes.

Proofreading checklist

1. Concepts
 - Ideas are organized and structured
 - Support arguments with facts
 - Avoid hyperbole and generalizations
 - Use concise language and avoid filler
 - Avoid awkward sentences
2. Writing style is appropriate for the audience
3. Consistent voice, correct grammar and spelling

Requirements

Course credit

This course is designated as a "c-required course." From the bulletin description of the program, "To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44." For more information about degree requirements, see the [bulletin description](#).

Hardware

1. Computer: This fully online course will require access to a computer that meets the minimum requirements set by World Campus.
2. Internet: You will need broadband Internet to view videos and other media content.
3. Camera or camereaphone: You will be asked to document various aspects of your work
4. Printer/scanner: A printer will be helpful for printing out paper templates. A scanner is optional, but would be helpful.

Software

1. Web browser: You will need to have the latest version of either Google Chrome, Safari, Firefox, or Microsoft Edge.
2. Accounts: In addition to general University account access, you will be required to create an account with InvisionApp.com
3. Software installs: You will need to download and install an open-source desktop application called Twine from Twinery.org. It is possible to use a web version of this software if you cannot or wish not to install it on your computer.

Materials

1. Journal
 - o Any journal is fine. I recommend the Moleskine Cahier Journal, Large, Squared, Kraft Brown, Soft Cover (5 x 8.25) [Amazon purchase link](#)
2. Pens, pencils, markers
 - o Any that you already own are fine, you do not need to purchase special ones for this course. However, the following recommendations are professional grade if you are so inclined to invest in quality drawing tools.
 - Pencil: Palomino Blackwing 602
 - Pen: Copic Multiliner Marker 0.5 - Black
 - Marker: Copic N2
3. Scissors
4. Post-it Notes
5. Poster board (or large open wall space) for the post-its

Book

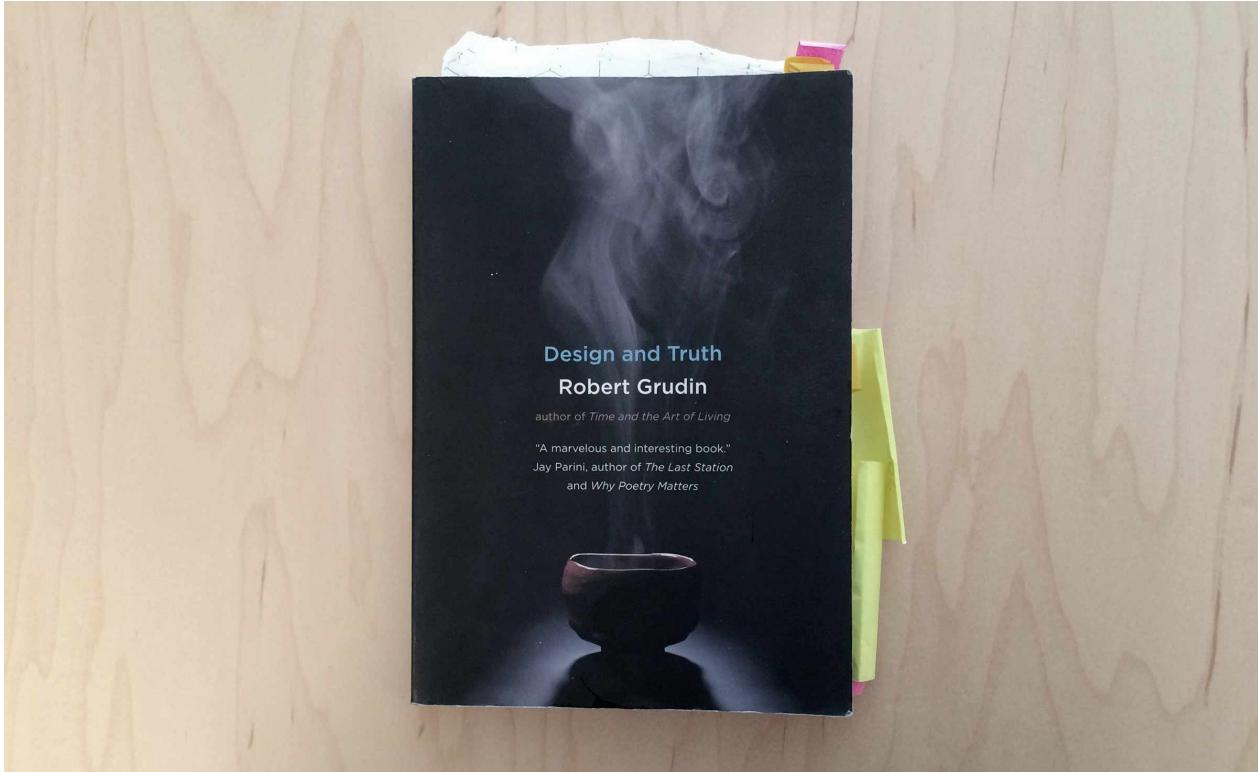
We will be reading *Design and Truth* by Robert Grudin. You will need to purchase a copy of this book.

Misc

Students get [free Amazon Prime shipping](#).

Introduction

In this lesson you will learn about how design thinking, systems thinking, and critical thinking play important roles in the process of design and the complex implications that design has for the world. The Double Diamond design process will be introduced and will be applied to projects in later lessons. You will have a daily design journal activity that spans two weeks, culminating in a personal reflection writing. Podcasts have been selected that talk about design issues from a range of perspectives. 99 Percent Invisible is one of my favorite design podcasts and covers a range of fascinating design issues.



You will begin reading the book, *Design and Truth*, by Robert Grudin. I chose this book because it's an easy read, introduces historical references, and talks about design at a very high level as it applies to multiple domains of study. Grudin attempts to describe what design is and connect it to philosophy, ethics, economics, governance, education, and notions of truth. I have assigned reading responses for each book chapter so you can begin connecting ideas from the book to your personal experiences and perceptions. These assignments are not meant to be book reports, 150-300 word concise responses will suffice.



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."

I think we can go even broader. I will now attempt to define the broadest definitions of design possible with the English language. 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 satisfy an intended outcome**. 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 aught 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.”

Citations

1. <https://www.vitsoe.com/us/about/good-design> (Commons CC-BY-NC-ND 4.0)
2. Wade, Nick. Braun RT 40 Radio by Dieter Rams. <https://www.flickr.com/photos/nickwade/4123875041>
3. http://www.infrastructures.net/Infrastructures/About_-_how_we_define_design..html



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 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 layperson, 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 up on 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.

Citation

1. *Design and Thinking*. Dir. Mu-Ming Tsai. 2012. Film.
2. James A. Lawrence and Earl N. Steck, *Overview of Management Theory* (Carlisle Barracks, PA: U.S. Army War College, 1991), ii & 34. <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2/GetTRDoc.pdf&docID=235762>
3. http://thinkingandmaking.com/files/design_maturity.pdf
4. <http://www.dmi.org/?page=2015DVIandOTW>



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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3. Lethem, Jonathan. *Adam Curtis and the Secret History of Everything*. The New York Times Magazine. October 27, 2016. Retrieved 28 December 2016.
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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]

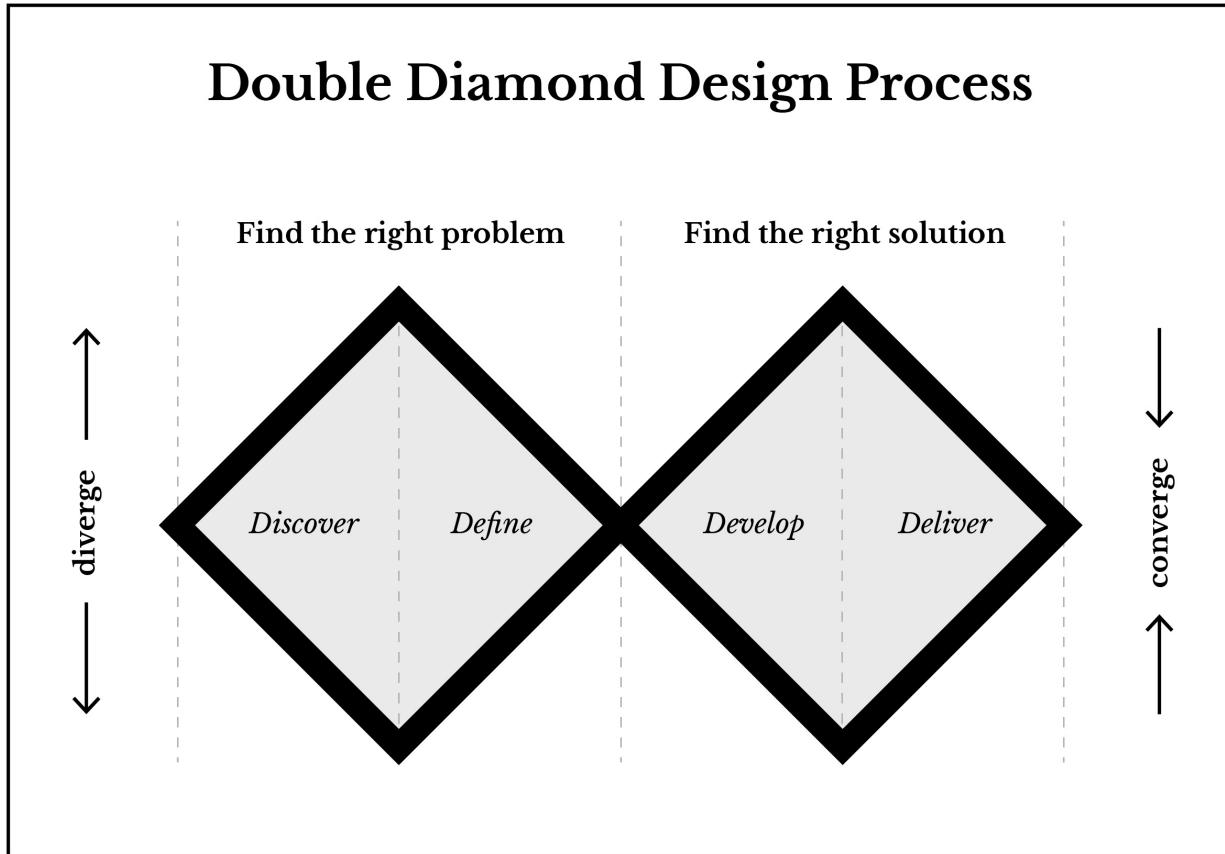
The term 'critical making' is intended to highlight the interwoven material and conceptual work that making involves. As a teaching and research strategy, critical making shares an emphasis on values with both critical design and critical practices — such as the critical technical practice[5] from which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

Citation

1. Richard Paul and Linda Elder, *The Miniature Guide to Critical Thinking Concepts and Tools*, Foundation for Critical Thinking Press, 2008
2. Condensed and adapted from: A quick primer for ethics in design.
http://mlab.uiah.fi/polut/Yhteiskunnalliset/lisatieto_ethics_primer.html
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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.



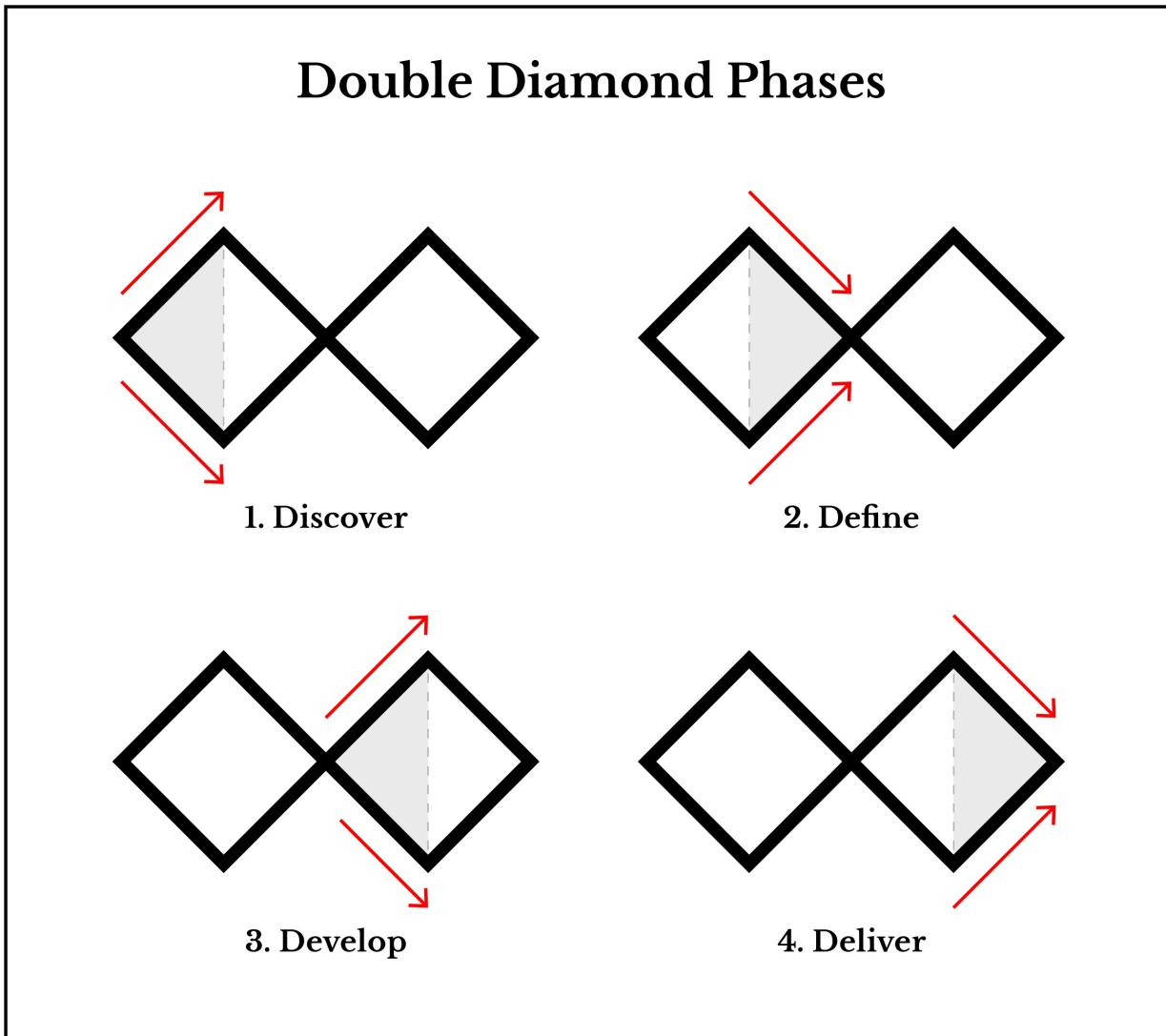
In this course, we will be adapting and simplifying a design process model called the Double Diamond, originally created by the British Design Council, and reimagined by [Dan Nessler](#). The shape of a two-dimensional diamond is meant to be visual analogy describing the divergence and convergence of 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.

Chapter 1&2. Sen Rikyu and the Paradox of Innovation

Book chapter:

Sen no Rikyu and the Paradox of Innovation, Good Design Tells the Truth (p. 3-26) in Design and Truth by Robert Grudin

Writing prompt:

In this chapter, Grudin hypothesizes what good design is and what it should be. After reflecting on this reading, discuss a time where you had an overwhelmingly good experience or overwhelmingly negative experience with some aspect of design. This could include a product, service, or any other manifestation of design.

Writing guidelines:

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

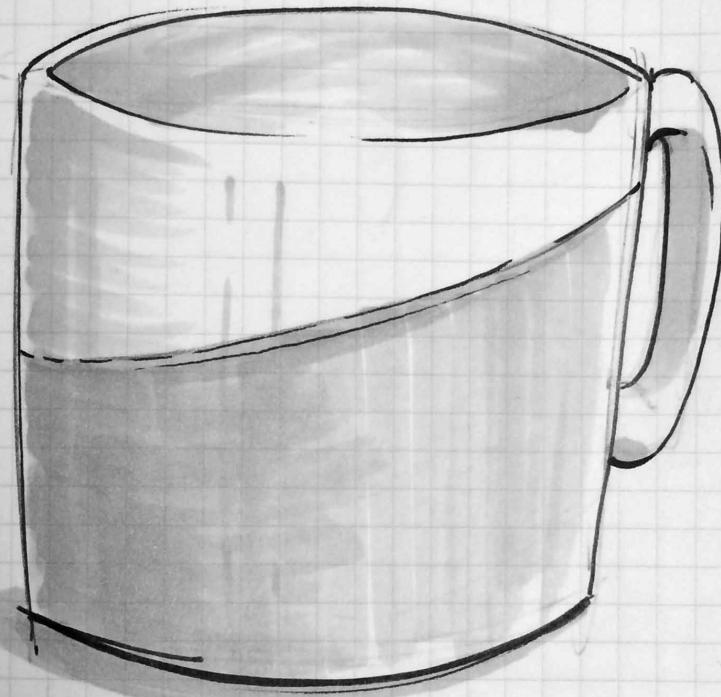
Daily Design Journal

Through drawing, you will visually document and notate at least 10 objects using your journal. Keeping a sketchbook or journal with you is a useful habit for tracking observations and ideas. In this activity, we will use this practice to make observations about objects that are close to us every day.

Journal sketching requirements

1. Please number the object sketch at the top of the page
2. Draw your object in the upper 2/3 of the journal page
3. Write details and observations in the lower 1/3 of the journal page and include the name of the object.

DESIGN JOURNAL ENTRY #5



COFFEE MUG

- I USE THIS MUG TO DRINK TEA, NOT COFFEE
- IT WAS A GIFT FROM A FRIEND
- IT IS HAND-MADE, ONE OF A KIND
- I'VE HAD IT FOR 5 YEARS
- THE MUG IS STORED IN MY KITCHEN
- IT HAS SHINEY WHITE GLAZE ON THE TOP HALF, AND A MATTE UNFINISHED SURFACE ON THE BOTTOM
- IT'S SIGNED ON THE BOTTOM

DRAWING AREA 2/3 (5")

DESCRIPTION 1/3 (2.5")

Note: Because this course is not a life drawing course or industrial design course, the quality of your drawings are irrelevant to your grade. If you are interested in seeing how a product is typically sketched, you can take a look at [this video of Reid Schlegel of Frog Design demonstrating his technique](#). Sketching and rendering by hand is something that any one can learn, but it takes quite a number of years of practice. If you are interested in learning, I recommend spending some time on [Core77.com's sketching page](#).

Materials

- Pencil, pen, marker
- Sketching Journal (Recommend Moleskine Cahiers Squared Journals)

Instructions

1. Visually document 10 object sketches that are typical for you to interact with in your daily life. You can use pen, pencil, markers, or any combination you'd like.
2. Write contextual notes about the objects' materials, dimensions, and functionality. Focus on the design (shape, form, etc.) of the object and how that relates to the way you interact with it. You may also include information about what the purpose is or where you acquired it. Be thorough and specific, as if you're an archaeologist examining an artifact.
3. Please follow the journal sketching requirements.

Daily Design Journal

Now that you have documented at least one object each day for two weeks, it's time to talk about it, shown-and-tell style.

Prompt

1. From the 14 objects that you sketched, which are your favorite objects? Why?
2. Select one object from your list. What role does this object play in your life? What would be the result if you did not have it anymore?
3. Do you generally take these objects for granted or are they special?

Instructions

1. Respond to the prompt questions in Canvas.
2. Upload all 14 of your sketches in JPG format.
 - o **Please either use a scanner or take clear and well lit photographs.**
3. Write your responses to the prompt questions at the end of the two weeks.

Creative Mornings: Design Is Magical

Listen to David Kelley, founder of IDEO and the d.school at Stanford University, as he talks about how the role of design has changed over the years.

[Creative Mornings: Design Is Magical by David Kelley \(55:55\)](#)

Lawn Order

Listen to this 99 Percent Invisible podcast episode called, *Lawn Order*, where the grass lawn, an entirely designed object, signifies power, prosperity, and community participation.

[Lawn Order \(19:11 min\)](#)

End of lesson discussion

Introduction

In this lesson you will learn about design topics that expand your understanding of the visual and conceptual nature of design.

You will put the Double Diamond design process into practice to produce the first course project, where you will conduct design thinking exercises and build an interactive mobile application prototype. You will also finish the journal activity, continue *Design and Truth* book chapter reading assignments, and have a chance to listen to some more design podcasts.



[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]

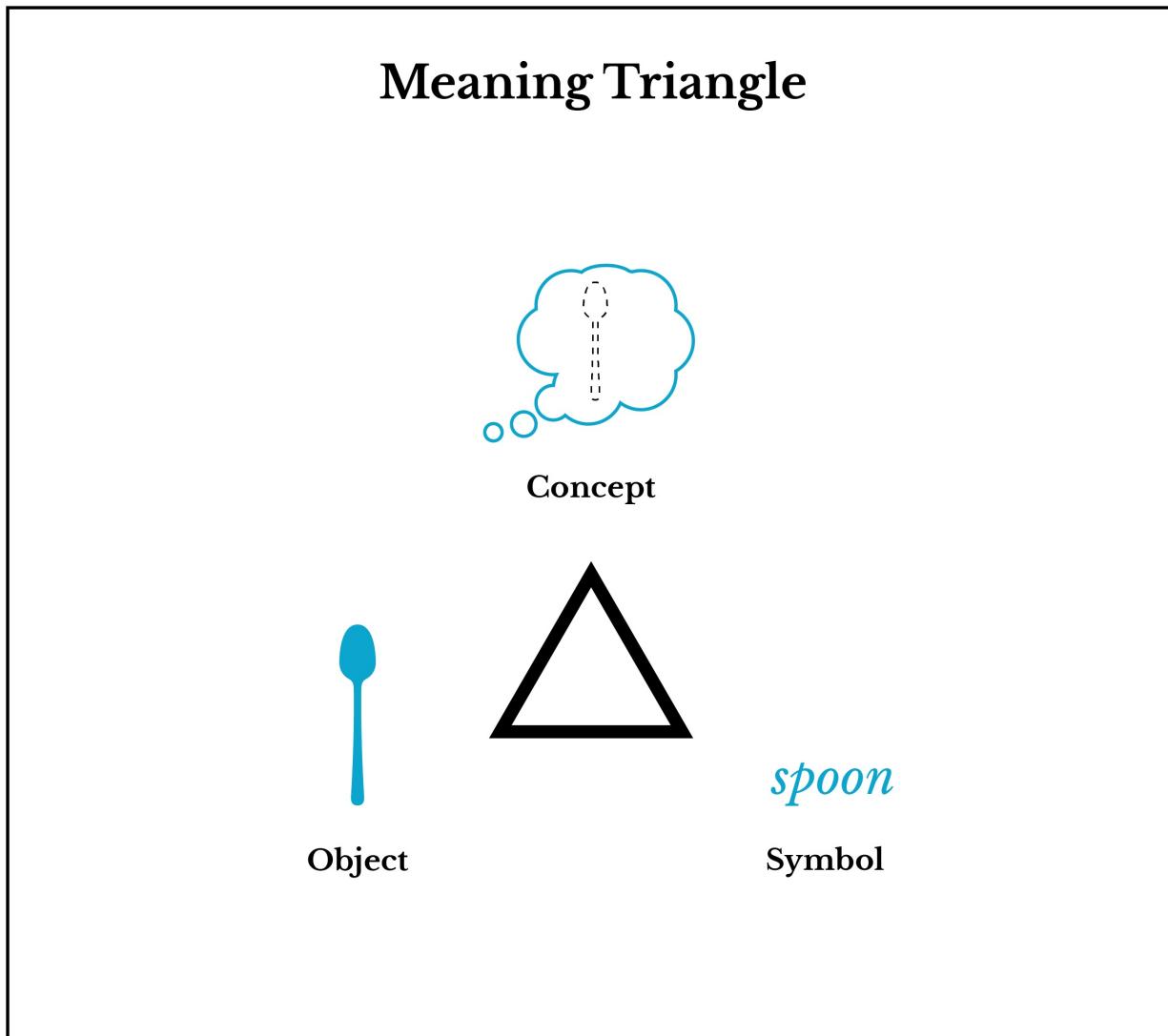
The three categories of signifiers are the **(1) Icon**, **(2) Symbol** and **(3) Index**. An icon resembles some physical attribute of the signified. A symbol is an arbitrary form that is connected to the signified only through cultural association and convention. The fact that you can understand this 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.

Citations

1. ECO, UMBERTO. "THEORY OF SIGN PRODUCTION." *A Theory of Semiotics*, Indiana University Press, 1976, pp. 151–313, www.jstor.org/stable/j.ctt16xwcfd.8. René Magritte, *The Treachery of Images* (1928-9). ("This is not a pipe."). Accessed Dec. 31, 2016. <https://www.wikiart.org/en/rene-magritte/the-treachery-of-images-this-is-not-a-pipe-1948>
2. <http://www.jfsowa.com/ontology/ontometa.htm>

3. Lucie Guillemette and Josiane Cossette (2006), « The Semiotic Process and the Classification of Signs », in Louis Hébert (dir.), *Signo* [online], Rimouski (Quebec), <http://www.signosemio.com/eco/semiotic-process-and-classification-of-signs.asp>.

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

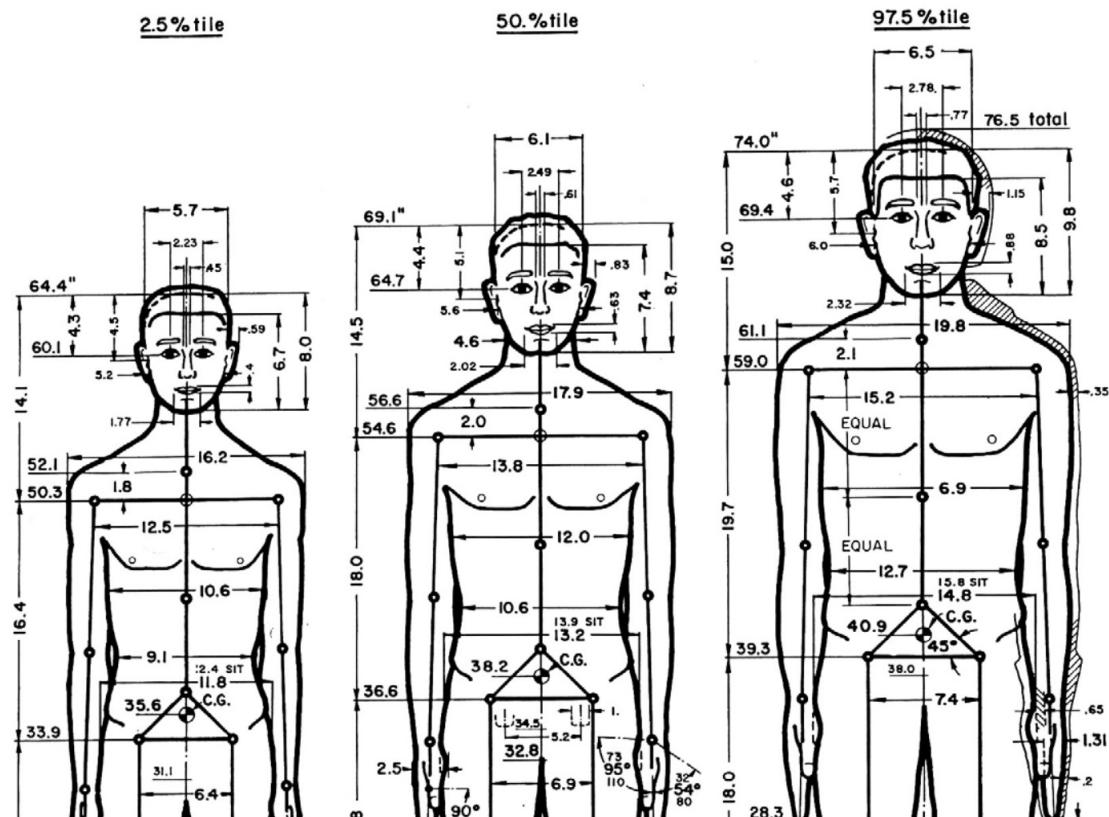


Image from *The Measure of a Man: Human Factors in Design* by Henry Dryfuss

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.

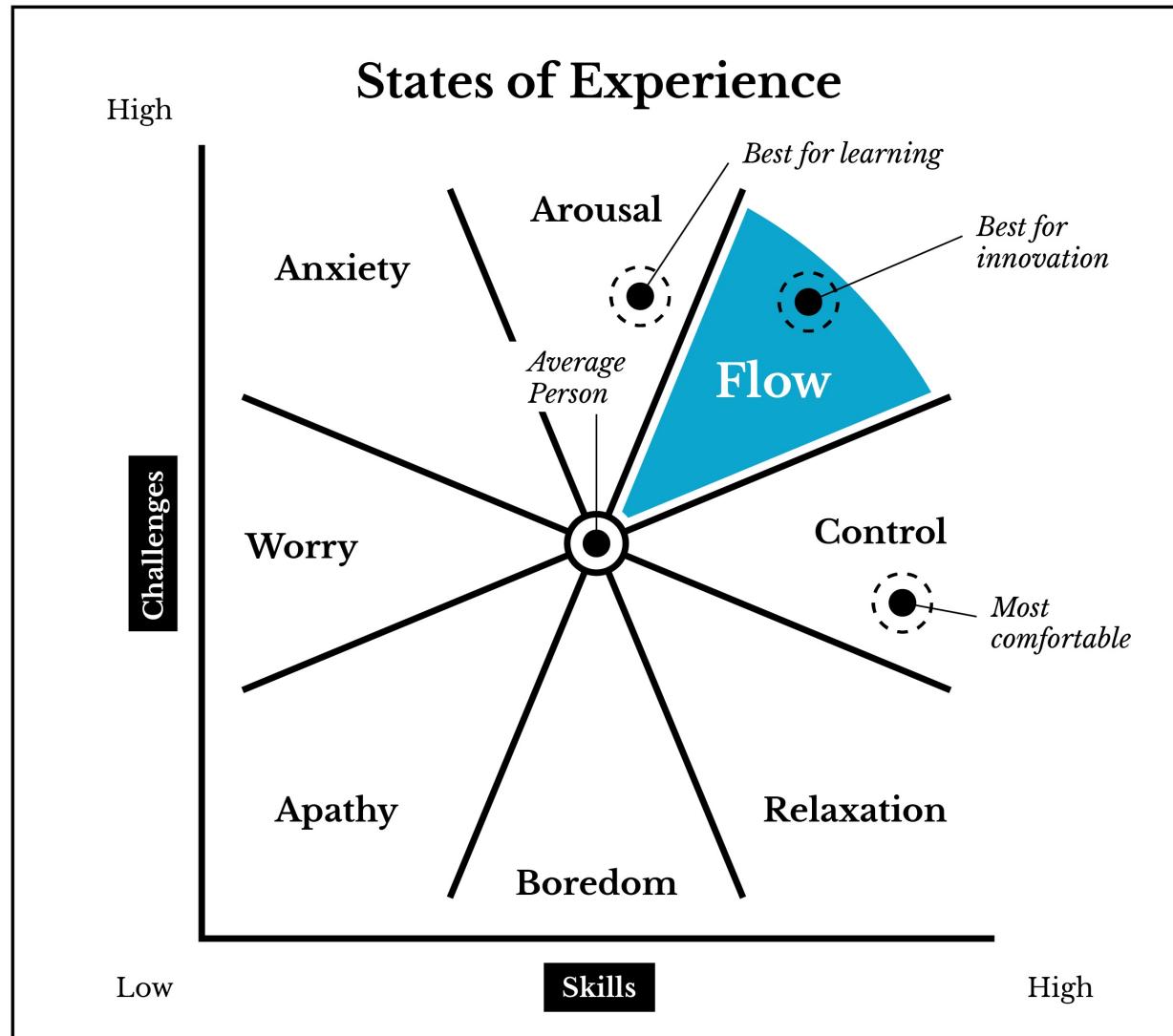
Flow

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 eight 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.

Citation

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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—envisioned the future.

— Sharon Poggenpohl

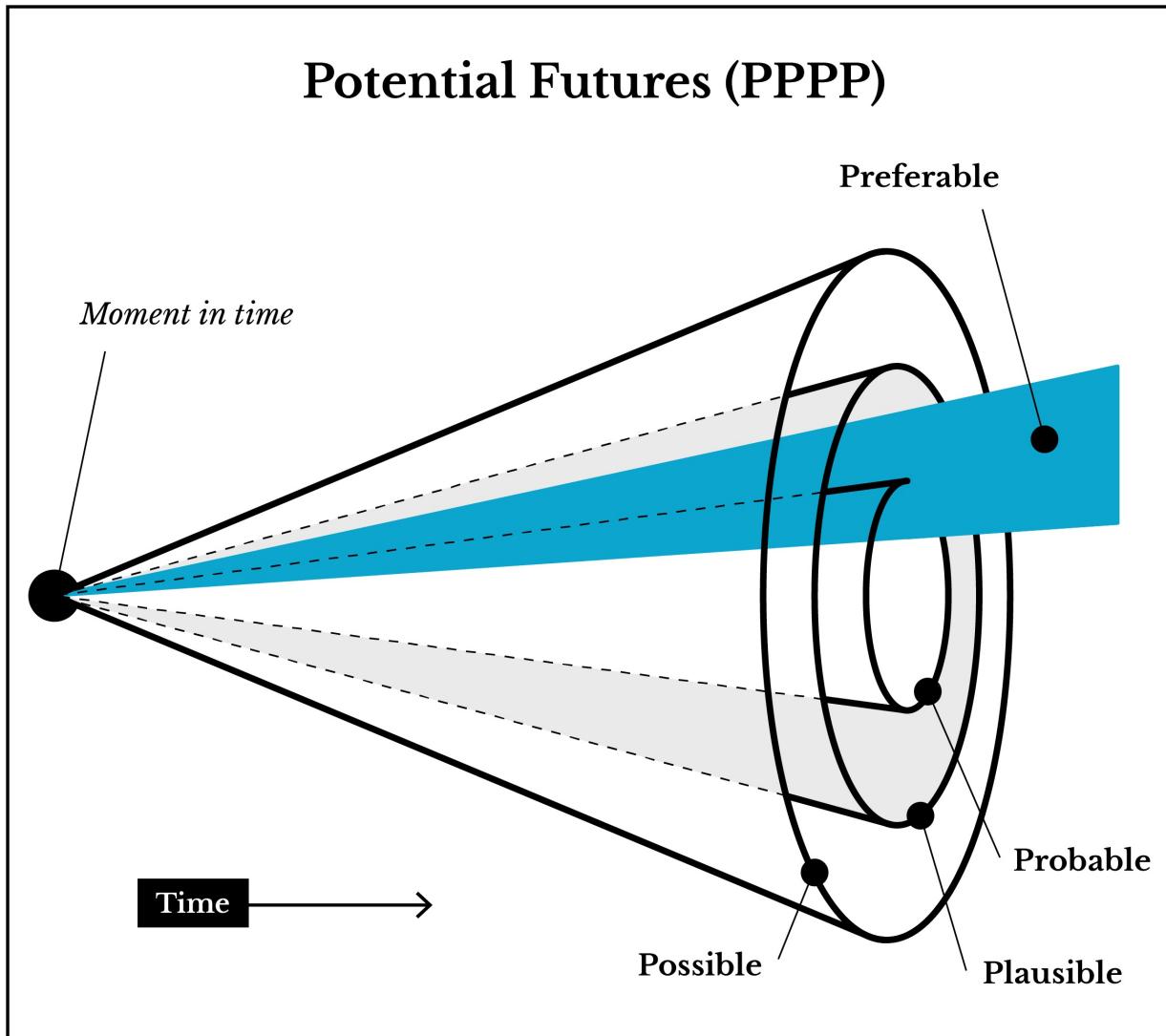
Because speculative design is concerned about the future, it is helpful for us to consider something called the **Theory of Change**, which can help you map outcomes and causalities. Theory of change is concerned with figuring out what choices can be made in order to achieve positive future outcomes. 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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8. Dunne, Anthony. Raby, Fiona. Speculative Everything: Design, Fiction, and Social Dreaming. 2013. Page 4.
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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

What Design and Truth Say about Each Other

What Design and Truth Say about Each Other (p. 27-33) in *Design and Truth* by Robert Grudin.

Prompt

In this chapter, Grudin talks about the transition of design from close dialogue with natural systems to proliferating to the point of being totally separate from those systems. Grudin outlines 13 principles for good design to achieve harmony between nature and technological advancement. Do you agree with him?

Describe specific examples of designs affirming or negating some of the principles.

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Design as Tragedy: The Rise and Fall of the Twin Towers

Design as Tragedy: The Rise and Fall of the Twin Towers (p. 34-45) in *Design and Truth* by Robert Grudin

Prompt

In this chapter, Grudin talks about how economic tradeoffs and cultural appropriation may have contributed to great tragedy. What are other tragedies (large or small) related to design that you know of from current or historical events?

How might designers be trained or regulated to avoid causing harm?

Should designers be held accountable when their work causes trauma or destruction?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Edsel's Law: How Bad Design Happens

Edsel's Law: How Bad Design Happens (p. 46-54) in Design and Truth by Robert Grudin

Prompt

In this chapter, Grudin describes the Edsel scale for measuring the quality of a design. Provide a detailed description of an object not mentioned in the book that would earn low negative points and an object that would earn high positive points. Explain why you've allotted the objects' points.

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Designs of Darkness

Designs of Darkness (p. 55-61) in Design and Truth by Robert Grudin

Prompt

In this chapter, Grudin makes a distinction between painting styles of Adolf Hitler and Winston Churchill as well as the social design ideologies of Martin Heidegger and Sen no Rikyu.

Can you identify contemporary people that may have similar contrasting design sensibilities? Their differences don't have to be political; artists and designers can have different sensibilities regarding cultural values, aesthetic taste, scale, technology, or other aspects of their work.

Compare two or more creators with divergent sensibilities on opposite extremes. Support your claims with vivid descriptions and cited facts.

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Face to Face with Design

Face to Face with Design (p. 62-82) in Design and Truth by Robert Grudin

Writing prompt

In this chapter, Grudin talks about fixing and designing material objects which had some meaning in his life. Now think of a time that you designed or fixed something when you had a meaningful connection with. Describe the specific design choices you made and what they reveal about you and the experience. What specifically created a strong connection with this object or subject?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

VOX: It's not you. Bad doors are everywhere.

VOX: It's not you. Bad doors are everywhere

This VOX and 99% Invisible collaborate on this short documentary with famed design author, Don Norman. Spoiler alert, it's about doors.

Youtube: [It's not you. Bad doors are everywhere. \(5:31\)](#)

99 Percent Invisible: On Average

"In many ways, the built world was not designed for you. It was designed for the average person. Standardized tests, building codes, insurance rates, clothing sizes, The Dow Jones – all these measurements are based around the concept of an “average.” The average person is a term that is thrown around quite a lot, and design is often created for people who are average in some way. But does the average person actually exist? Listen to this 99 Percent Invisible Podcast as they investigate.

[On Average \(20:50 min\)](#)

99 Percent Invisible: 10,000 years

Communicating ideas through visual images can be difficult. Listen to this 99 Percent Invisible podcast episode called Ten Thousand Years, where designers attempt to warn future civilizations about the dangers of radioactive waste.

[99 Percent Invisible: 10,000 Years \(31:51 min\)](#)

Ritual Project



Brief

For this project, you will be designing a ritual and producing a prototype for a mobile app that would support the ritual in some way.

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 and interview. From there, you will pull out themes, develop a "How might we" question, develop ideas as a group, create and test prototypes, and produce a final fully interactive app proposal. Solutions to this project brief should not be literal solutions for solving your interviewees problems, but rather experimental rituals that ask or nudge people to change their behavior in some way, and creatively explore the themes identified in the interview.

What not to do

When you go through the research process, it may be tempting to design for a direct, literal problem. For instance, you may hear from your interviewee that they have trouble dealing with time management or remembering to get certain tasks done. Your first instinct would be to solve this issue by designing a todo list or calendar tool. However, a quick Internet search will reveal many todo and calendar tools, and unless you are planning a radical shift in how those particular tools function, it makes sense to approach the problem from a different perspective. By trying to gain insight into the behavior of your interview subject, you can come up with novel ritual ideas that seek to create new types of behavior.

Your project must contain elements of novelty and does NOT need to solve a literal problem. **Please avoid calendar and todo list design solutions for this project.**

Inspiration

- [Somebody App](#)
- [Ritual Design Lab](#)
- See Wade Davis TED Talk on ritual and what makes us human. **(19:08)**
https://www.ted.com/talks/wade_davis_on_the_worldwide_web_of_belief_and_ritual

Medium articles:

- [Can we design rituals to improve orgs' culture?](#)
- [The 3 most unconventional designers of 21st century — starting with Design shaman](#)

Previous student work

"Signly" by Daniel Bershefsky, 2017: [Download \(10MB\)](#)

Materials and tools

- Camera or scanner (a smartphone camera is fine)
- InVisionApp account: Visit <https://www.invisionapp.com/education-signup> to get a free education account. Use this activation code: **56-73-13-19**
- Graph paper
- Pens, pencils, markers
- Scissors
- Post-It notes

Requirements

- Develop interactive wireframe screens for an app that supports a ritual using prescribed software.
- Keep the mockup "low fidelity". You may develop a logo and branding, but do not spend significant time on developing graphics. It should feel like a paper prototype. No prior software skills are necessary, though you may already be familiar with software design tools like Photoshop, xD, Sketch, or Figma,

- Create only black and white wireframes. Do not make aesthetic decisions like color and typography for this project.
- Avoid developing calendars and todo apps. Imagine creative, novel ideas to create a symbolic experience for your subject.
- Take good quality photos/scans of your designs. Text should be legible and free of harsh shadows, glare, etc.

Further reading and relevant rituals

Watch this [TED Talk by Wade Davis](#) (19:08), from the [Ritual Design Lab](#) about how rituals are a universal aspect of human civilization, and learn about some traditional rituals from the analog era.

[Somebody App](#) by Miranda July and Miu Miu in 2015, this experimental app let users send messages to people by way of a third party — resulting in a stranger finding you in real life and reciting a message to you. By creating unexpected and surreal social experiences (watch the video) and complicating our normally instant communication with "missions," uncertainty, and a fun blobby user interface, the app designed a magical real world experience facilitated by an app.

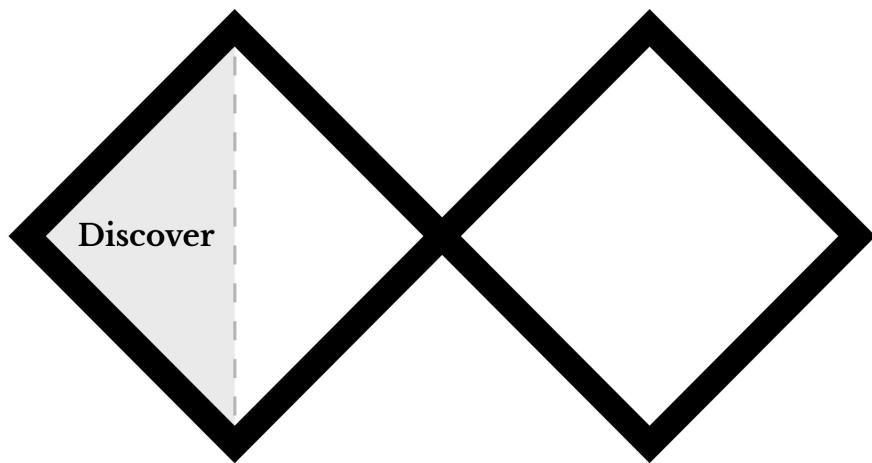
While this project focuses on designing an *experience*, you will be creating a basic user interface, so it will be helpful to look at real world interfaces for inspiration. The apps and websites you visit everyday are full of visual designs and conventions that you can borrow from, but one important designer to look at is Susan Kare, creator of early icons for the Mac operating system. This article about [Susan Kare's early work at Apple](#), reveals some of her inspiration and sketches for the early icons. Her focus on creating a "friendly and humane" experience is a reminder that technology can support our natural emotions and experiences rather than dominate them.

Margaret Hagen asks [Can we design rituals to improve orgs' culture?](#) in this great article on Medium. She gives props to employees and asks them to design a ritual in five minutes, resulting in "rubber duck head-drops, the knighting of each other with thick black glasses, bear-paw growls, and pinecone tosses." Hagen helpfully defines rituals as the "magic and meaning of special actions," which should remind you that rituals are supposed to be *different* from normal behavior and can be very strange indeed!

Finally, Kursat Ozenc writes about [The 3 most unconventional designers of 21st century—starting with Design shaman](#). The other two design approaches he mentions are also based on traditional spiritual roles and their rituals. Are there other worldviews that can be applied to design beyond the typical ones?

Previous student work

"Signly" by Daniel Bershefsky, 2017: [Download \(10MB\)](#)



Discover: Interview

Field research is a central part of the human-centered design process. You will now practice field research by finding and 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

The purpose of this interview is to better understand the day-to-day challenges that a person faces. Set up an interview. It can be a family member, a friend, a colleague at work, a student, etc. Ensure that you have at least an hour of time. The interview can be in-person, over the phone, or via video conversation. Please do not send a list of questions to your interviewee, as you will need to tailor the interview questions during the conversation. If you intend to record the interview (not required) you must obtain the permission of the interviewee.

Step 2: Find challenges

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, 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, awkward pauses may result in valuable responses if you're patient.

Example questions

Daily challenges:

1. Tell me about your day today or a typical day in your life.
2. Do you find anything particularly challenging about your daily routine?
 - i. Do you have any reoccurring frustrations?
3. If you could change something about your typical day, what would it be?
4. Is there something that, if only you were incredibly good at it, you could improve some aspect of your life?
 - i. Why aren't you good at it? ("it" should be a specific thing see **Laddering - Five 'Why?'s**)

Life-long challenges:

1. What is a long-term challenge or frustration in your career or life?
 - i. Why is it challenging? ("it" should be a specific thing, see **Laddering - Five 'Why?'s**)
2. If you could go back to childhood and begin your life again, what would you want to do as an adult?
 - i. Why did you choose this answer?
3. Is there anything preventing you from doing this now? If so, what are some of those things?
 - i. Why do you think that is? ("it" should be a specific thing, see **Laddering - Five 'Why?'s**)

Core Values

1. What do you value more, **adventure or stability?**
 - i. Why do you think that is? ("it" should be a specific thing, see **Laddering - Five 'Why?'s**)
2. What is a place that has special meaning to you? (At home, or elsewhere)
 - i. What details can you recall most clearly? Describe them.
3. What is a group, culture, or "tribe" that you strongly identify with?
 - i. How do you participate in, or show your connection to, that group?

Original Questions

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

1. _____?
2. _____?
3. _____?

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 a potential user's problems. Try not to make reference to the project during the questions that may lead the interviewee to attempt to think of solutions.

Instructions

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

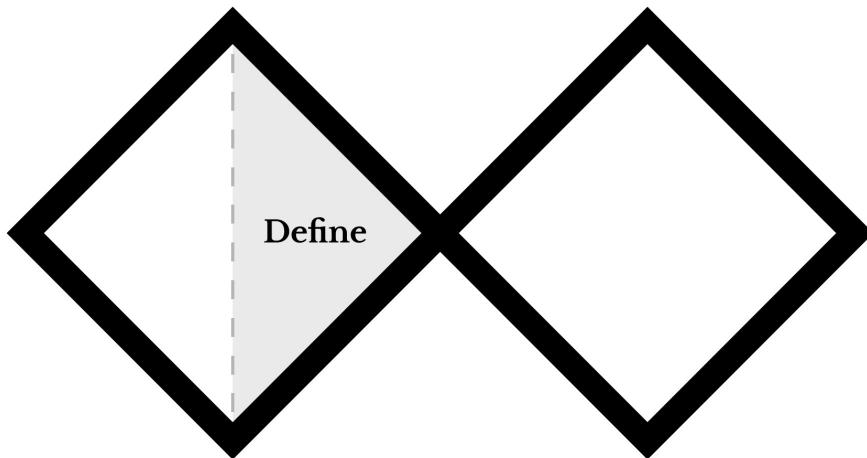
Post work

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.

Citation:

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

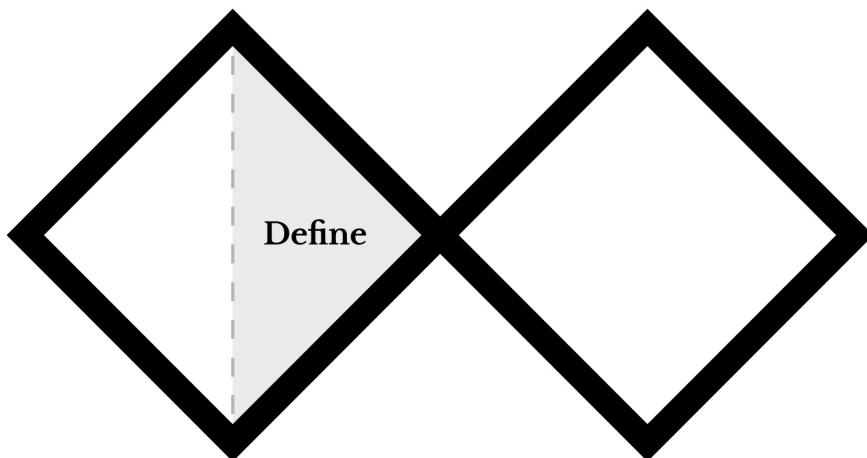
1. Re-read your interview questions and answers.
2. In your journal, write "**themes**" at the top of the page. Write down your answers as single words or very short statements to the following questions:
 - i. What patterns did you notice? For example, "routinely late for work."
 - ii. Did anything 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

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**) ?

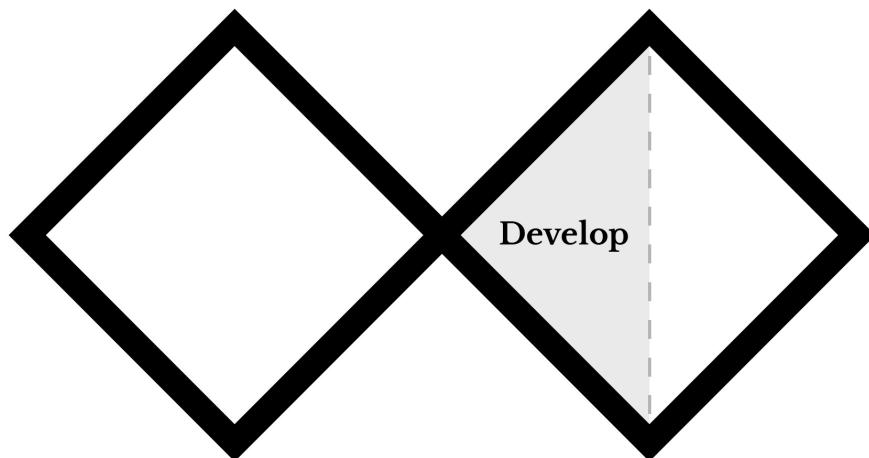
Instructions

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

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.



Brainstorm

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. You will use the free Dropbox tool called [Paper](#), to collaboratively contribute ideas to your group members projects.

Note: If there is a timezone issue, and your group can not find an agreeable meeting time, contact your instructor.

Note 2: If you have technical issues, please see "Solving technical issues" section.

View an [Example Paper](#) brainstorm session.

Group Member Name	Ideas
Ellie	<ul style="list-style-type: none"> We could find dino DNA in old mosquitos trapped in sap! How would we keep them from spreading out of control?
Grant	<ul style="list-style-type: none"> Can we dig them up? Let's just start digging and see what happens.
Hammond	<ul style="list-style-type: none"> We could use frog DNA to fill in the missing parts! Let's build on an island so guests can feel like they are in the past
Gennaro	<ul style="list-style-type: none"> Oh, we could attract more visitors with coupon day
Malcom	<ul style="list-style-type: none"> We should be careful about doing this. Life finds a way.

Hey, should have these at the park. Scary!

Updated 20 seconds ago (?)

Materials and tools

1. Sign up for a free account on <https://paper.dropbox.com/>
2. Computer with microphone and steady Internet connection
3. Video conference: [Penn State Zoom](#)

Roles and Rules

Discussion Rounds

1. **Team Leader:** A Team Leader is randomly assigned and is responsible for coordinating the group's brainstorm session.
 - i. The Team Leader will coordinate a meeting time and send out a video meeting link with the group.
2. There will be one brainstorming round for each person in the group.
3. Each member should access the Paper website ahead of the brainstorm session and locate the document's share link.
4. Each round will focus on a different person's **HMW** question.
5. **Facilitator Role:** For each round, the person currently in focus for the discussion will be the facilitator of the discussion, and is responsible for downloading their finished whiteboard and uploading the image to the Studio.
 - i. The facilitator is responsible for keeping time.
 - ii. Responsible for downloading their own How Might We...? document in Word (docx) format.
6. Spend about 10-15 minutes per round.

Brainstorming

1. **Quantity over quality.** The goal is to generate as many ideas as possible.
2. **Defer judgement.** Silly and outlandish ideas are just as useful as, and sometimes more exciting than, sensible ideas.
3. **Be positive.** When building upon others' ideas, use "yes, and also" instead of "but" or "well." These small language nuances change the tone of the discussion to feel more supportive and inclusive.
4. **Focus.** It's easy to derail a brainstorming session. If it happens, refocus on the task at hand.
5. **Simplify.** If an idea takes two sentences to describe, try simplifying it to the core idea using as few words as possible.

Instructions

Before the brainstorm session

1. Read the Roles and Rules.
2. Access <https://paper.dropbox.com/>.
3. **Team Leader:** Collect group member links to share with group (contact group members prior to the call via email if needed). Setup a group video, and invite group members.

During the brainstorm session

1. Introduce yourselves with the chat tool or the live call feature.
2. Decide on the order you will all go.
3. First Facilitator: Set a timer for 15 minutes.
4. The Facilitator will write the **HMW** question at the top of the document.
5. The group will spend up to 15 minutes generating ideas for the **HMW** question.
 - After 10 minutes: As a group, briefly discuss which ideas you like.
6. The next facilitator sets a timer for 15 minutes.
7. Repeat steps 4-6 until all group members have taken their turn. You are now finished the brainstorming session.
 - Make sure download the Paper doc, in Word (docx) format.
 - Thank each other for their contributions and end the session.

Download and export instructions

1. Once you have finished with the brainstorm, click on the 'more' menu button (three dots) and choose "Download."
2. Select Word (docx) format and again choose "Download."
3. Once the file has been generated, choose "Download" again.

Mike's brainstorm session - Dr. Michael

Secure | https://paper.dropbox.com/doc/Mikes-brainstorm-session-LXePCzDG128wgby37An36#

Mike's brainstorm session ★
DMD 100 - Lesson 2: Develop Brainstorm • Only me

MC G Invite ...

Star
Following

Move
Archive

Doc history
Word count

Present
Print
Download

Mike's brainstorm session

How Might We create a theme park, but with real dinosaurs?

Group Member Name	Ideas
Ellie	<ul style="list-style-type: none"> We could find dino DNA in old mosquitos trapped How would we keep them from spreading out of control?
Grant	<ul style="list-style-type: none"> Can we dig them up? Let's just start digging and see what happens.
Hammond	<ul style="list-style-type: none"> We could use frog DNA to fill in the missing parts! Let's build on an island so guests can feel like they are in the past.
Gennaro	<ul style="list-style-type: none"> Oh, we could attract more visitors with coupon day
Malcom	<ul style="list-style-type: none"> We should be careful about doing this. Life finds a way.

Hey, should have these at the park. Scary!



Updated 1 hour ago

Mike's brainstorm session ★
DMD 100 - Lesson 2: Develop Brainstorm • Only me

MC G Invite ...

Export

Choose a file format...

Word (docx)
 Markdown

Cancel Download

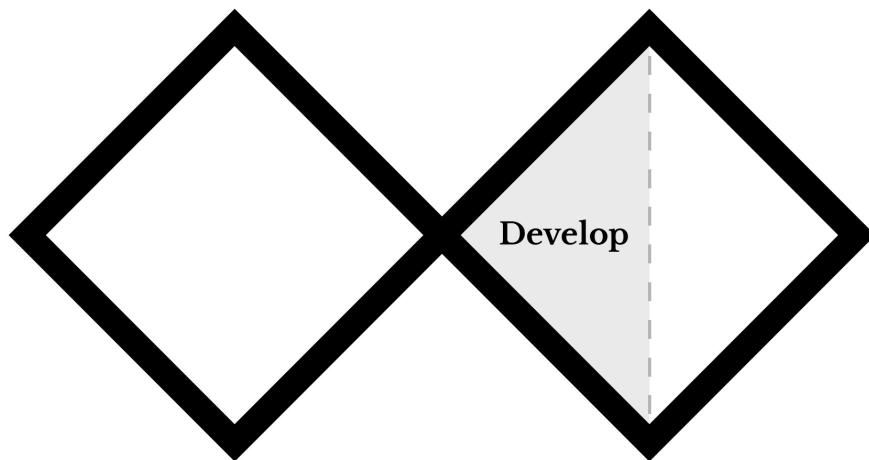
How Might We create a theme park, but with real dinosaurs?

Group Member Name	Ideas
Ellie	<ul style="list-style-type: none"> How would we keep them from spreading out of control?
Grant	<ul style="list-style-type: none"> Can we dig them up? Let's just start digging and see what happens.
Hammond	<ul style="list-style-type: none"> We could use frog DNA to fill in the missing parts! Let's build on an island so guests can feel like they are in the past.

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.

- Follow **download and export** instructions to download the brainstorm document in Word (docx) format.
- Upload the .docx file to studio.



Develop: Storyboard

Refer to the ideas generated during the brainstorm. Did any strike you as interesting, silly, novel, or brilliant? Brainstorming sessions don't always lead to useful or good ideas, so it's important to be realistic about their utility in your design process. For this assignment, you will develop and map out key aspects of a creative ritual as a storyboard.

The storyboard is a sequence of drawings or images that communicate what the ritual is and how it will occur. This will give others the opportunity to provide feedback, and forces the designer to think about all of the key decisions in more detail. This storyboard should be fairly abstract, and does not need to reference the app at all.

IMPORTANT: *The storyboard should show a person performing the ritual. It should not show any screen-based content.*

Review the Introduction page for this project, and recall that while you are trying to help your subject, the point is not to optimize efficiency but to create a meaningful ritual. **Do not make a traditional to-do list or calendar app.**

A good ritual is:

- Symbolic.
- Separate from everyday routine.
- Made of highly prescribed actions (e.g. tea ceremony).
- Special (e.g. dressed up, weird, silly, magical, or important).

Materials

- Pen and/or pencil
- Journal
- Camera or scanner
- Printer
- [Ritual Storyboard Template](#)

Designing the ritual

There are many descriptions available of what a ritual is and how it functions. We will consider four key aspects as core design components for the ritual.

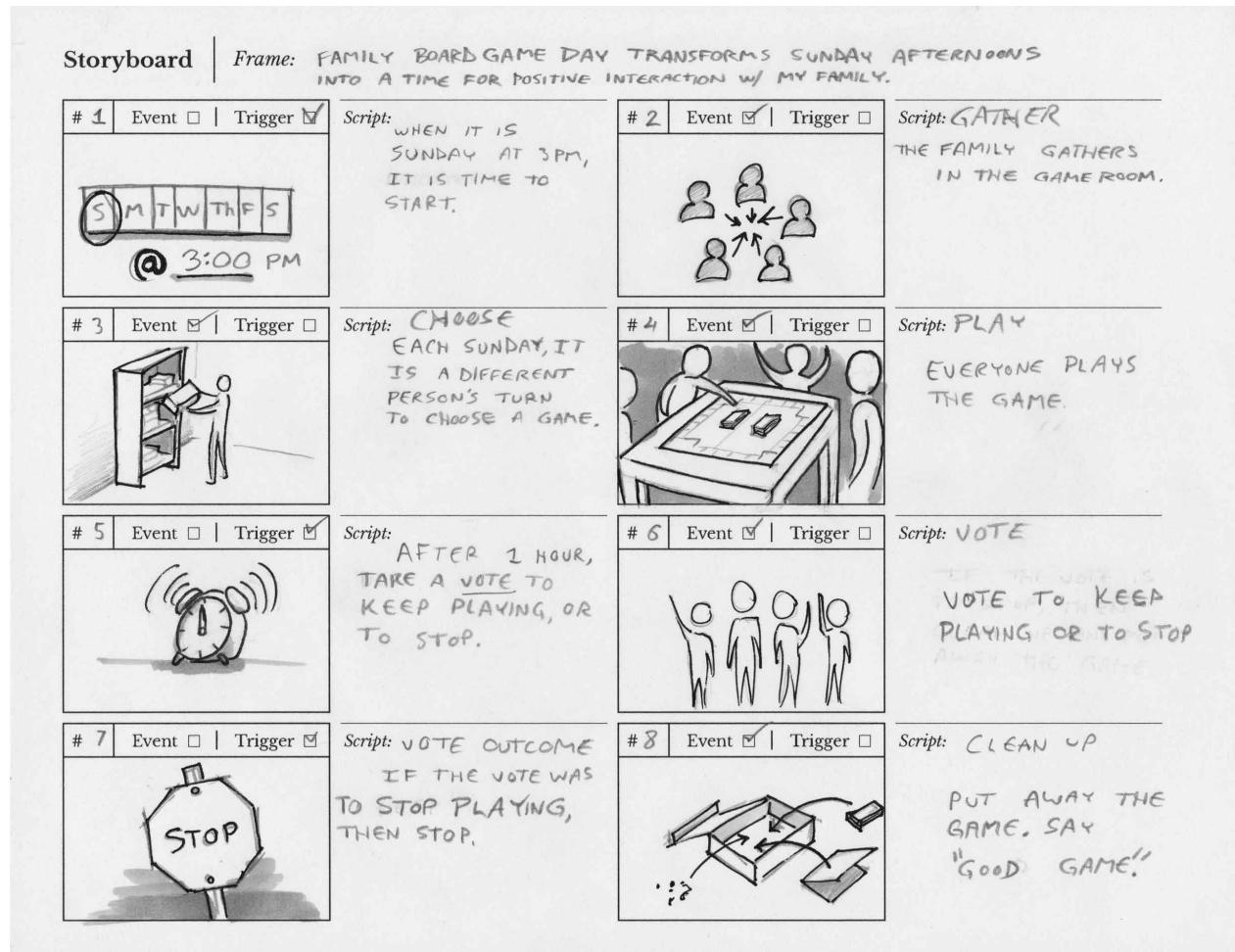
1. **Script:** The script describes the triggers and the associated events.
2. **Frame:** The frame is the mental model that suggests what the ritual's purpose is, and what the intended outcome is. Instead of writing, "I play board games with my family on Sunday," you would add context for why the ritual is important and instead write, "Family Board Game Day transforms Sunday afternoons into time for positive interactions with my family."
3. **Trigger:** A trigger could be a time of day, the onset of a certain feeling, or some other moment that initiates the ritual, and the ritual's related events. For example, "It's Sunday afternoon" is a trigger to start the ritual. "Sunday afternoon is over," indicates that it's time to stop the ritual.
4. **Event:** An event is any action or performance that occurs in the ritual. Indication to start an event comes from a trigger or script. Example events include, "Gather in the game room," and "choose which board game to play."

Instructions

1. Download: [Ritual Storyboard Template](#)
2. Write the **frame** and list all of the **triggers**, **events**, and **scripts** that comprise the ritual on the storyboard.

 - i. Number the sequence to indicate the flow of the story board (e.g. #1, #2, etc.)
 - ii. You can print the Ritual Storyboard PDF or use a markup tool to write directly on the digital file.

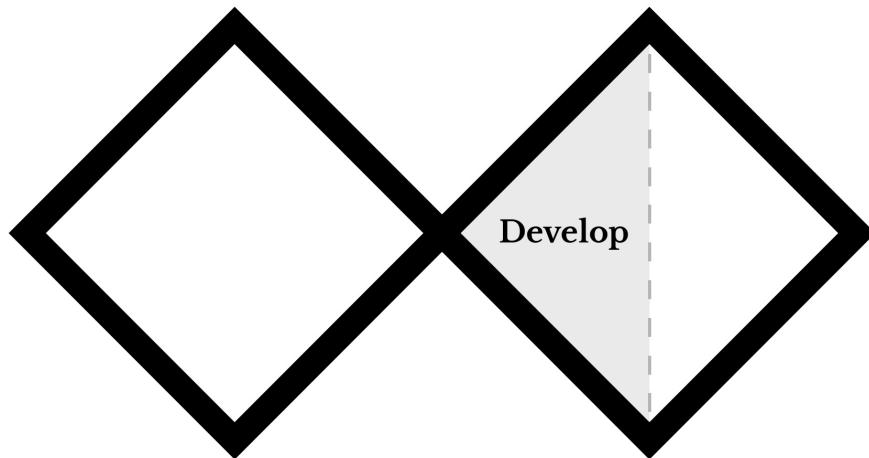
3. There must be a minimum of one fill sheet (8 boards) describing the ritual.



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 the Storyboard to the studio as a scanned or well-photographed image.



Develop: Interactive Wireframes

Now that you have described the various aspects of the ritual, you will create interactive wireframes for a mobile app.

The app should aid in the performance of your ritual. The app does not need to solve your subject's problems all by itself; it should act as a guide, instructional manual, supplemental tool, or other component of the ritual. The ritual can involve physical actions that take place outside of the app, in the real world, with other people, or in the user's mind.

Wireframes are informal sketches that help designers test their ideas so they can quickly iterate the design and gather feedback.

This process is important because it helps product designers make decisions before wasting resources on a final product that solves the wrong problem. Your wireframes should *not* include aesthetic decoration, complex color palettes, or final typography — those concerns of visual design would happen in the next phase of an app's development, a high-fidelity mockup that finalizes the exact appearance before being given to developers to code the actual app.

You will create simple app screens using paper templates or simple digital designs. The sequence or collection of screen designs will then be placed into a digital tool to make them interactive — letting us click buttons and interact with the prototype as if it were a real app. The purpose of these wireframes is to quickly communicate to your peers how you intend to use a mobile device application to facilitate, generate, or expand upon a ritual.

Tools and Materials

1. Pen or marker
2. Assorted paper
3. Scissors
4. Ruler
5. Cellphone Camera
6. [Figma Education account \(free\)](#)
7. Paper Prototyping PDF: [PDF Download](#)

Technical resources

Cropping images

You will be able to crop and adjust the color of your images in Figma (which you'll use anyway for assembling your prototype), but you may wish to prepare your images beforehand. Here are some quick tutorials for cropping images.

- [Windows](#)
- [Mac OS](#)

Figma tutorials are provided on the next page.**

Instructions**

A. Creating wireframes

1. In your journal, you can list the parts of the storyboard that can translate into mobile application functions. For instance, if the ritual has a timer component, you can make a note that you'll need a visual (or audio) cue for the timer.
2. Look at wireframing inspiration:
 - i. [Gallery of sketched wireframe images](#)
 - ii. [PageFlows](#) (documentation of real app interaction flows)
 - iii. [Laudable Apps](#) (curated iOS app images)
 - iv. [Dribbble](#) (search for “wireframe” or “mobile app”)
3. Create the app's interface screens using either of the following options:
 - i. Method 1: Paper
 - i. If you prefer to use pencil and paper, you can either draw the wireframes or download and print the Paper Prototyping PDF.
 - ii. Draw and cut out interface elements including buttons, images, icons, navigation, text, and other elements needed to prototype your app interface.
 - iii. Cut out reusable interface elements so they can be rearranged for each application screen.
 - iv. Arrange the components for each screen and take a picture with your phone's camera.
 - ii. Method 2: Digital designs
 - i. Alternatively, you may create your screen designs digitally. Since the visual design is not complex, you could use any number of apps for this, but since we'll be using Figma to add interactivity to the screens, I recommend simply using that, as Figma is a popular and capable UI design tool. Guidance on this will be provided on the next page.
 - ii. Note that digital designs should be mostly or entirely grayscale. They are still wireframes and should not feature aesthetic decoration.
4. Crop any photographs to the crop marks.

B. Making an interactive prototype

Once you have your screen images prepared, download them onto your computer in a dedicated folder. Backup to cloud storage for extra security, such as your [PSU OneDrive storage](#).

Continue to the next page for guidance on using Figma to make your images interactive.

Submissions

Prototype Description

- Start your description with the following: "**This is a prototype for an app that...**" To complete the sentence, synthesize your brainstorming and storyboard ideas.
- Describe the ritual in detail and how the prototype app is intended to work. How does it support the ritual?
- Write clearly, and check for grammar and spelling [errors](#).

Instructions

1. Create interactive wireframes using the prototyping instructions on the next page.

2. Open the Presentation View of your app and click Share to get a public sharable link. Do not use the share-link for your main design file.
3. Write a prototype description according to the requirements and include your public share link. (Check the link in a private-browsing window to ensure it works for other people.)

Figma Tutorial

Figma account set up

Figma is a 2D design app that is popular for designing user interfaces, but is great for other creative work too. If you've used Adobe Illustrator before, you should feel right at home. Figma supports synchronous [multiplayer editing](#), annotated comments, and other features to support online collaboration.

To get started, sign up for a [free Figma education](#) account using your school email.

You can use Figma in your web browser or install a [dedicated desktop app](#). Both versions are the same, with the desktop app making it a bit easier to use local fonts installed on your computer.

Once you're logged in, note that you can create two types of files in Figma:

- Figma Design file: The fully featured design and prototyping tool we will use for this project.
- FigJam file: A simpler "whiteboard" app for brainstorming and notes.

Choose your workflow

As described on the previous page, we're going to use Figma to create an interactive prototype based on wireframe sketches. There are two ways to approach this, and either is valid:

1. Create paper wireframes, photograph them, and make them interactive in Figma.
2. Create the entire thing in Figma, using digital text and shapes. (Some tips appear below.)

Because we are more concerned with designing an *experience* than a polished visual design, I'll focus on the "paper wireframe" approach first as that requires less mastery of the software.

Method 1: Paper Wireframes

See instructions on the previous page to prepare your wireframe images of each app "screen."

Getting started with Frames

Create a new "Design file" in Figma and select the **Frame tool** (**F**). In the right sidebar, labeled "Design", you should see a list of preset Frame sizes; click one of the Phone sizes and you should see a white rectangle appear in the main canvas area. (If you used the paper template, choose iPhone 14.)

Your browser does not support the video tag.

Adding a Frame

Frames display their name in the Canvas area, as well as in the lefthand "Layers" sidebar. After placing a Frame, you'll switch back to the default **Move tool** (**v**) that is accessible via the arrow icon in the toolbar. You can give the Frame a more descriptive name (e.g. "Welcome page") by double-clicking its name in the main Canvas area or the lefthand "Layers" panel.

Your browser does not support the video tag.

Renaming a Frame in the Canvas and Layers panel.

Adding scanned images

With your Frame selected, look in the righthand "Design" panel for the "Fill", which, by default, is set to white. Click on the white square to the left of the text reading "FFFFFF" (that's the color code for pure white) to reveal a color picker.

At the top of that panel, select the button for “Image” to upload one of your scanned images and apply it as a background-image to the Frame.

Your browser does not support the video tag.

Adding an image as a fill

Depending on the [aspect ratio](#) of your image, it may appear cropped in the Frame. With the Fill panel still open, select the dropdown menu that, by default, is set to “Fill.” These are options for how the background image is displayed:

- **Fill:** The image will fill the entire Frame, and crop it as needed.
- **Fit:** The entire image will be displayed, and you may see empty areas in the margins (like letterboxing in a movie).
- **Crop:** Manually crop and resize the image within the Frame.

Your browser does not support the video tag.

Cropping images

Resizing Frames

You can resize a Frame by clicking-and-dragging a corner, or by typing exact pixel dimensions into the Design sidebar while the Frame is selected.

If you hold `⌘` (Mac) or `CTRL` (Windows) and drag the corners of the Frame, it will resize the Frame independently of the background image and functionally crop the image or reveal sections that are currently cropped.

To duplicate a Frame, hold `Alt` (Mac) or `opt` (Windows), click on a Frame and *drag* a copy to a new location. (You can do this with any element!)

Your browser does not support the video tag.

Duplicating a Frame.

Help! My images aren't the right aspect ratio.

The preset “Phone” sizes available within the Frame tool use a variety of aspect ratios, so you can try a few and see if one is close to your scanned images.

Alternatively, you can drag all your images into Figma at once, and then wrap them in Frames that match the image sizes.

Your browser does not support the video tag.

Importing multiple images at once.

Alternate batch import method:

1. Select multiple images in your OS file browser.
2. Drag them into the Figma canvas area.
3. Right-click one image at a time and “Frame Selection” (Mac: `⌘G` | Win: `Alt+Ctrl+G`)

Check the size of these Frames though — if your images are very large (e.g. 4000px tall) then the resulting Frames will also be very large, and could lead to some problems. If that’s the case, select all the Frames/images and use the **Scale Tool** (`K`) to drag-and-resize them to something closer to the size of a mobile phone (check the preset Frames for reference).

Check the Presentation view

Before we start adding interactions, let’s check how our images look in the final Presentation view.

Click the big ► Play button in the upper-right corner to launch a new tab displaying your Frames in a slideshow-like presentation. By default, you should see your images within an illustrated phone. If you used one of the preset Frame sizes, the image should fit the device pretty well (though you may discover some content is obscured by the camera notch).

Your browser does not support the video tag.

Testing out Presentation View.

If there's a big gap, meaning your image's aspect ratio doesn't match the phone's... Go back to the Design file and click the "Prototype" tab in the right sidebar. Here, you can change the device used to present the app. Scroll through the options to find "Custom Size (fit)" — this will remove the phone illustration and display your Frames as you've made them.

Adding click targets

You can make an app prototype in Powerpoint by simply displaying a sequence of screen images — but with Figma, we can create a nonlinear experience that lets users click on elements to navigate between screens as if using a real app. (As well as prototyping other interactions and animations.)

If you're working with scanned paper wireframes, you'll need to add *additional* Frames *within* each screen to act as clickable targets.

With the Frame tool (F) selected, click-and-drag over a button or UI element in one of your wireframe images. This will create a new Frame *inside* of the larger Frame; you should rename it to stay organized.

Your browser does not support the video tag.

Creating an "inner Frame" to act as a clickable target.

Like our larger Frames, this Frame can have a Fill color or Stroke (border). To more easily keep track of your Frames while you work, you can either:

- Set a transparent Fill color by lowering the opacity in the color picker. (A solid fill color would obscure your drawing.)
- Add a [Stroke](#) (border) to your Frame.

Give this frame a descriptive name if you want (e.g. "button").

Adding interactions

In the right sidebar, switch from the "Design" tab to "Prototype."

If you hover your mouse over this edges of this new "overlay" Frame, you'll see little circles appear. Click on one of those circles, and drag a line towards another Frame.

Your browser does not support the video tag.

Adding an interaction.

When you release the line, you'll see an interaction panel appear showing that you've created a "Navigate to" interaction, along with the name of the destination Frame. (An image needs to be in a Frame for this to work.)

Now hit that Play button and view your app in the Presentation tab! Test your interaction by clicking the target and navigating to the second Frame.

Your browser does not support the video tag.

Testing interactions in Presentation view.

Back in the design file, you can edit or delete an interaction by selecting the connection line, including options for transition speed and animation type.

Go forth and create more more Frames and connections!

i TIP: You can duplicate your "click target" Frames by holding Option/Alt and click-dragging on the Frame. But make sure you haven't added an interaction to that Frame, otherwise you'll duplicate that too!

Method 2: Make everything in Figma

You can follow the workflow above, but instead of scanned images, you'll need to use some additional tools to create your wireframe screens:

- [Text tool](#)
- [Shape tools](#) (rectangles, ellipses, lines, etc.)

Remember this is a wireframe! — Not a fully designed interface. Do not spend excessive time choosing fonts, colors, or making illustrations.

Your browser does not support the video tag.

Adding digital text and interactions.

If you create digital text or shapes, you don't need to create "overlay" Frames as described above. *Any element can become a clickable target for interactions*; not just Frames.

If you want an example of building a simple layout in Figma, see this tutorial on [making a simple profile card](#).

The best way to create a typical "button" is by creating a Frame and placing text inside it; you can [round the corners](#) of a Frame to make a pill-shape or a circle. In the example below, [auto layout](#) is used to center the text within the Frame and control interior padding.

Your browser does not support the video tag.

Creating a button with auto layout

To add icons, follow the instructions above for adding images, or [use a plugin](#) like [Feather Icons](#) to browse and add icons directly within Figma.

Advanced Interactions

App-wide navigation menus

Does your app have a navigation menu, with the same buttons appearing on many screens? You *could* manually link every button to their respective pages, but there's a more efficient way! The following video shows this in full, but the steps are:

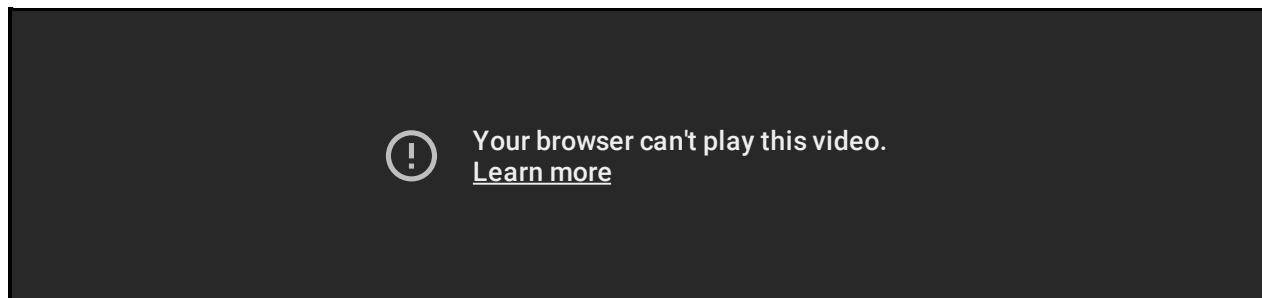
1. Create a standalone Frame containing just the navigation menu.
2. Turn it into a [Component](#).
3. Add prototype connections to desired pages.
4. Place an instance of that Component into each app screen.

Overlay Menus

Another common interface element is an [overlay](#), which could be a large popup window or a little dropdown menu. You can create these by simply including additional screens, which is totally fine for a low-fidelity wireframe.

But in some cases, you may wish to display content on top of the current screen without navigating to a new page. This will also be shown in the video below, but the steps are:

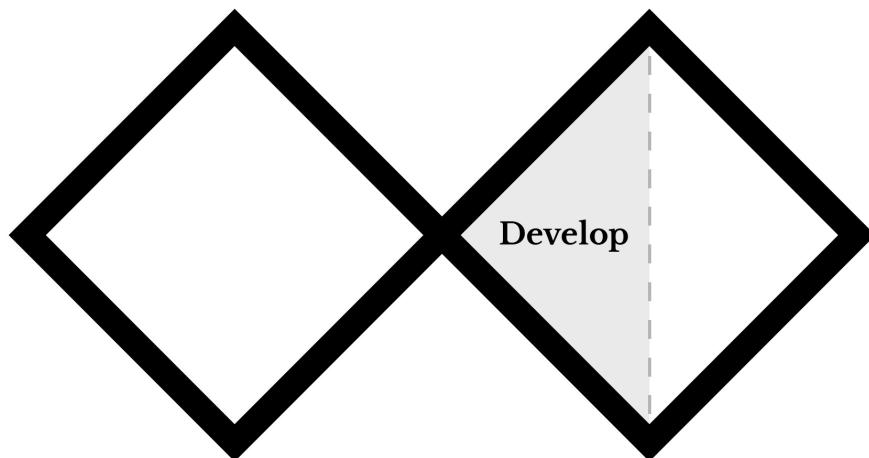
1. Create a standalone Frame with your overlay content (including a ✕ close button).
2. Select the trigger element in your main screen.
3. Add interaction → On tap → Open overlay (and select your overlay Frame)
4. Repeat for close action.



A note on file management

Figma lets you organize files in the following hierarchy: [Teams](#) contain [Projects](#), which contain Files.

Normal free accounts are limited to a single Team and 3 files (sad!) but with an Education account, you can create a [free Education Team](#) and gain unlimited files, as well as some other features.



Develop: Test and review

Now that your prototype is done, it is time to participate in feedback. You will be assigned a few prototypes to review. Your prototype will also be reviewed by your classmates. This is an opportunity to practice receiving and interpreting feedback. A critique of your work might be stressful at first, but it is one of the most common, and useful processes in design.

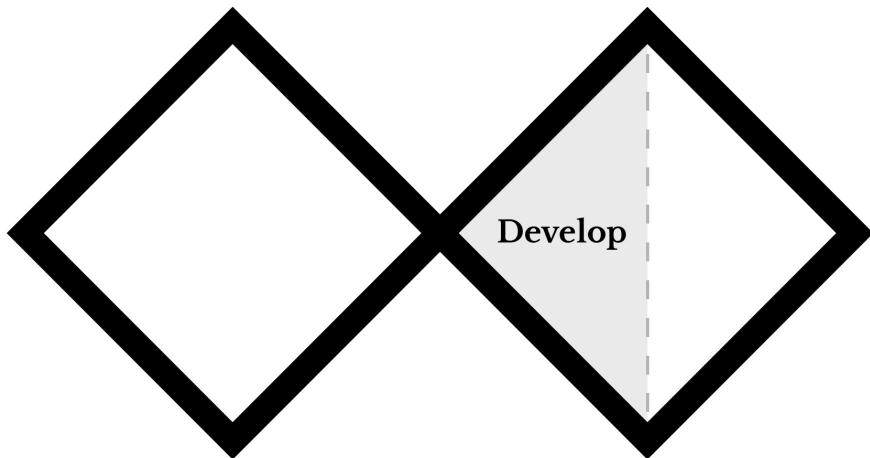
Instructions

1. **Provide feedback** to your assigned prototypes based on the following criteria:
 - i. Are you able to clearly understand the relationship between the app and the ritual? Why or why not?
 - ii. Does the app seem integral to the ritual? Why?
 - iii. What affordances does that app provide for a typical user.
2. **Read the feedback you have been given.** To plan a course of action, you can categorize what was said in four categories: compliment, advice, criticism, and suggestion. Based on which category the feedback lands, you can analyze how to make decisions to improve your work.

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. Post the corresponding feedback to your assigned feedback group member's assignment submission as a **comment** in Studio.
2. Combine all the feedback you've written and upload to this assignment's submission text field or upload a MS Word document.



Develop: Iterate prototype

This is the first round of iterative improvement. Read your feedback and consider how to implement the recommendations from course instructors and your peers. Keep in mind, your work should not be "high fidelity," concentrate on iterating and perfecting the app as if it were a sketch.

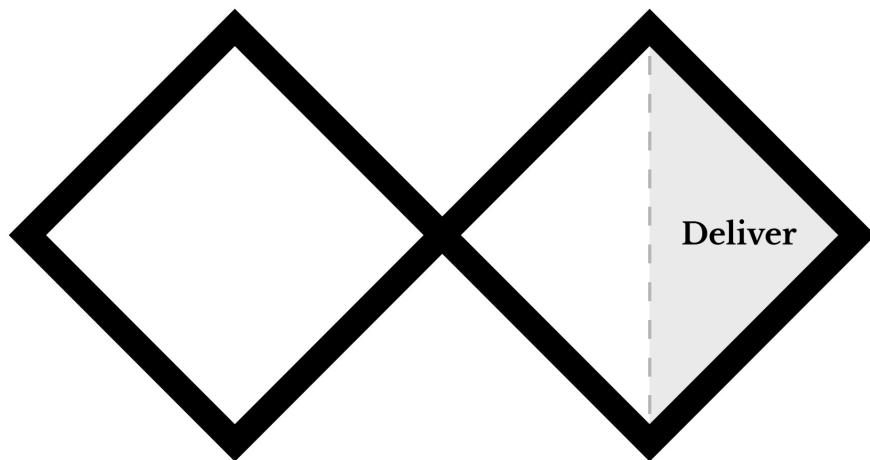
Instructions:

1. Make changes based on the peer and instructor feedback and **download** the prototype file from InVision. You will receive feedback, do not submit without iterating upon your work.
2. Write a description of the changes made to the prototype in a `.doc` file.

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. Upload a `prototype-USERID.zip` file of the prototype.
2. Upload a `changelog.doc` with all changes that were made.
3. Write your changes from the `changelog.doc` into the submission description text box.



Deliver: Final Prototype

Instructions:

1. Make changes based on the peer and instructor feedback and **download** the prototype file from InVision. You will receive feedback, do not submit without iterating upon your work.
2. Write a description of the changes made to the prototype in a `.doc` file.

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. Upload a `prototype-USERID.zip` file of the prototype.
2. Upload a `changelog.doc` with all changes that were made.
3. Write your changes from the `changelog.doc` into the submission description text box.

Storytelling

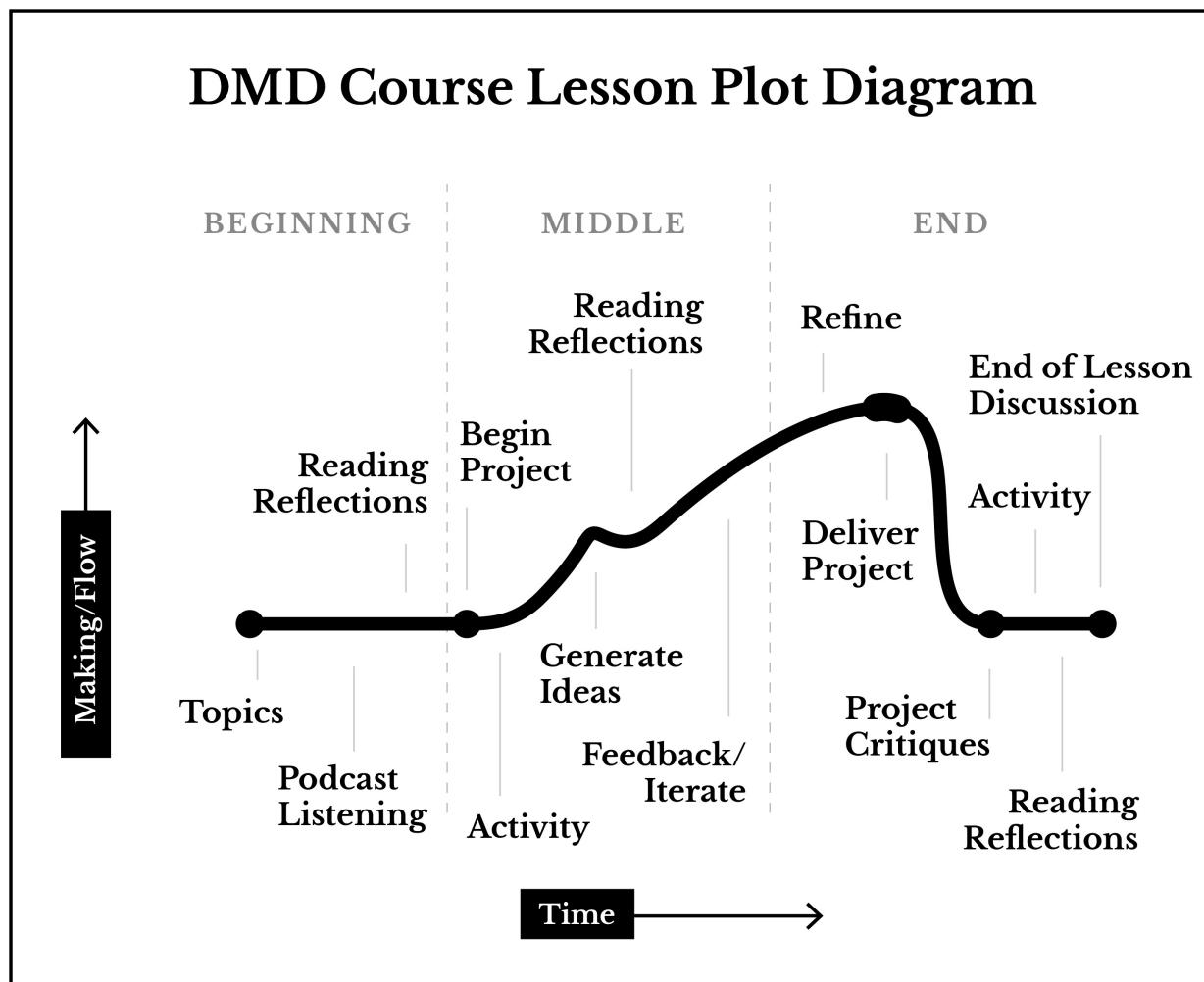
We are surrounded by stories. These stories affect our attitudes, beliefs, and form our entire perception of reality. Historically, stories are how humans have transferred knowledge from generation to generation. Everything a designer does will be in support of telling stories and by extension, shape the world we inhabit.

Storytelling has a long history as a mechanism of knowledge transfer and can be considered a rapid immersion in an experience: One cannot experience time travel, but one can gain knowledge about the act of time travel through a rich compelling, and highly experiential story.

— Jon Kolko

Lesson Objective

The goal of this lesson is not to teach you every facet and application of storytelling. Mastering this subject, as with most subjects, will take quite a long time. Instead, you will learn about common elements of storytelling, structural models, and methods for building stories that you can apply as a framework for most of what you create and communicate as a designer.



In this lesson, you will complete the following:

1. Read, watch, and listen to lesson topics and media
2. Reading assignment short reflections
3. Two activities
4. Interactive story project

5. End-of-lesson course-wide discussion

Citation

1. Kolko, Jon. *Thoughts on Interaction Design: a collection of reflections* / written and compiled by Jon Kolko. Second Edition. (2011) P.43 ISBN: 978-0-12-380930-8

Why stories?

In the talk, [The storytelling animal: Jonathan Gottschall at TEDxFurmanU](#), Jonathan Gottschall tells about the pervasive role stories play in the human experience. Storytelling is one way humans are able to perceive reality and make sense of the events unfolding around them. Reality is essentially organized by the storytellers of the world.

Meaning, however, cannot be created and widely distributed to people without going through some sort of cognitive filter. Most people are predisposed to favor information that supports their existing beliefs, and less likely to consider information counter to their existing beliefs, a condition called confirmation bias. This bias hampers reason-based decision-making and prevents a person from considering and using new ideas that are counter to the ones they already believe. Compelling arguments are needed for overcoming these types of biases, no matter what kind of story is being told.

A poorly delivered story presents us with what we can think of as a bad argument – that is that this story is not reasonable, we don't care about it, and it doesn't appeal to our sense of identity. Skepticism of new ideas can be assuaged with the persuasive argument's appeal to logic (logos), emotions (pathos), and ethics (ethos). What is reasonable, emotionally moving, and indicative of a someone's sensibilities is often specific to one point in history; from one culture to another; and from one person to another. For many, however, the appeal to emotion seems to be the driving force of an effective story, often moving viewers past logical or ethical shortcomings that may be present.

Great storytellers can have great impact. Storytelling does more than just help people understand the world. It motivates great action to be taken, moving an imagined dream into being. In this way, people who create and disseminate stories have a tremendous amount of power to shape the world. With this power comes an implicit contract with your audience – that what they are experiencing is authentic in a manner that allows them to understand a deeper truth.

A person can now read, watch, interact with, or listen to a new story every day for the rest of their life. Social media technology gives marketers the power to directly market stories according to a person's existing beliefs and interests, thereby surrounding a person in only the stories that support the reality they have already bought into. What effects might this have on a given society's ability to organize and govern when its inhabitants have found different interpretations of reality to be the "truth"?

Story and object

Semiotics, the study of signs and symbols, has produced models for describing how meaning is communicated; Ferdinand de Saussure's dyadic model consists of the signifier and the signified, and the Charles Sanders Peirce triadic model consists of icons, indices, and symbols. Just like [Forrest Gump's shoes](#), objects are "sign vehicles," targets of mental acts but these objects do [not have to be physical things](#). From the perspective of storytelling, objects are the medium by which a story is told. The authors of the book, *The Axemaker's Gift*, remind us that humans figured out how to do this with writing approximately 12,000 years ago.

"The first examples of writing occurred in the Near East at the time when animals and plants were being domesticated. They took the form of clay tokens, smaller than an inch in size, used to represent different commodities." [1]

The significance of this event is that people could now ascribe meaning (in this case to count grain and livestock for trade) using abstract markings on clay tokens. The token was a standardized signifier, which made commerce possible in prehistoric times. Eventually, the desire to describe other types of information led to the development of a written language and number systems. Out of that arose complex social structures, division of labor, law, cities, property ownership, and other aspects of modern civilization.

Stories, media, and society

Because story is ubiquitous to the human experience, you find it embedded in almost every human endeavor where communication of some kind is involved. Creative products like films, novels, drawings, paintings, comic books, and games tell stories to highlight moral quandaries, to contribute to discourse on a popular or marginalized subject, to function a teaching tool, to entertain, to enlighten, and to otherwise encapsulate cultural expression. Architecture uses form and dimension of space and structure to tell the story of how people should use space, to signal the culture of a place, and to describe other aspects of sheltered human interaction.

In product and service design, graphic designers use visual design elements to communicate simple ideas like how to use a voting ballot or abstract ideas like company brand identities. Industrial designers use visual and sculptural elements to communicate what a product does and how it should be used. Story can help businesses empathize with customers to create better products and services, recognize new ways of approaching solutions, and help customers choose between similar products.

Journalists working for televised news stations, newspapers, magazines, blogs, and other publications combine photography, video, and investigative reporting techniques to communicate information about events. *War of the Worlds*, a fiction written by H. G. Wells and adapted by Orson Welles to simulate a live news broadcast, was read on the live radio on Halloween in 1938, causing some listeners to panic, believing that there was a real alien invasion occurring. Similar in format to radio shows, podcast shows now combine journalism techniques, creative writing, and sound editing to tell compelling audio stories.

Politicians use stories to gain public support for proposed policies and actions whereas activists use coordinated gatherings with signage, music, song, dance, and other types of performance to communicate their stories to the general public. Social change agents use stories to create [empathy](#) through all forms of media, helping bring attention to marginalized members of society.

Citations

1. Burke, James, and Robert Evan Ornstein. The Axemaker's Gift: Technology's Capture and Control of Our Minds and Culture. 1st trade pbk. ed. New York: Putnam, 1997.

What is a story?

A story is a sequence of events and can be temporal (happen within the viewer's mind) or spatial (occur physically). A story (sequence of events) is expressed through narration, or the recounting of events. A narrative is a method of telling a story and is tangible. We know that a narrative is tangible because we can perceive the telling of stories through written text, sound, performance, image, etc. A narrative account of a split-second could last for the entire retelling whereas an event that lasted 100 years could be retold in a few seconds. Narrative places emphasis, focus, and perspective for stories. A plot is the connective tissue between story events, describing the causal relationships and context for viewers.

- **Story:** A sequence of events. Can occur spatially or temporally.
- **Plot:** Creates meaning by connecting story events with context.
- **Narrative:** Method of telling story.

Watch Kurt Vonnegut's humorous lecture on storytelling. [Shapes of Stories \(4:36\)](#)

Example Story:

Below, I have written a story (based on real events). I then described the plot of the story, and used written narrative to tell a single moment in the story from a third person Point of View.

Story

(1) A new family sets off on a routine, but potentially dangerous voyage. (2) Their baby gets sick (3) Their vessel takes on water. (4) They call for help. (5) They get rescued and face public scrutiny

Plot

Simon and Mary, along with their newborn child, plan to cross the Pacific Ocean in their sailboat—a journey they have done many times. They take all necessary precautions before the trip. Despite being cleared for travel, their baby gets a fever. There is a harsh storm that damages their sailboat and it began taking on water. With a damaged boat, a sick child, and no means of communication, they turn on a rescue beacon. The rescue team arrives in helicopter and they abandon their sailboat. They must then defend themselves from public scrutiny related to child endangerment and the high cost of a rescue at sea.

Written story narrative

"The waves have been crashing against the hull for hours. This has to be the worst storm we've ever sailed through," Simon thought to himself. To his horror, sea water begin to pour in through a crack at the base of the mast. He pulled the bright orange emergency beacon out of its case and looked at it. He looked over at Mary, who was sitting at the back of the cabin, cradling their infant. "If we turn the beacon on, it's all over," he yelled. She nodded, confirming the heavy weight of the decision. After all, it wasn't just a boat, it was also their home and they were about to abandon it. Forever.

Narrative structure

A narrative structure orders or disorders the events of a story for the audience, and combines those events with plot. A linear narrative is chronological, whereas a non-linear narrative is non-chronological. There are commonly used frameworks for storytelling which started with Aristotle's three-part structure consisting of a beginning, middle, and end. From there, structures become more nuanced and descriptive.

Stories are big business. Hollywood films tend to have structural models that traditionally sell well in the box office, increasing the probability that they will see a return on the production investment. The perception is that experimental or uncommon narrative structures tend to be risky. The same can be said for large game developers who are inclined to produce sequels of top-selling titles.

This can explain why many of the boundary-pushing films tend to come from independent authors and screenwriters, indie game developers, and indie filmmakers. They have less of a financial stake in the outcomes of sales, and are more likely to focus on new modes of expression, craft, and originality of content.

Dramatic structure

Gustav Freytag (1816 - 1895), a German dramatist and novelist, developed a structure for the way stories are told in ancient Greek and Shakespearean drama. This analysis is known as Freytag's analysis, dramatic structure, or Freytag's Pyramid. His analysis consisted of the following five acts:

1. exposition
2. rising action
3. climax
4. falling action
5. dénouement/resolution

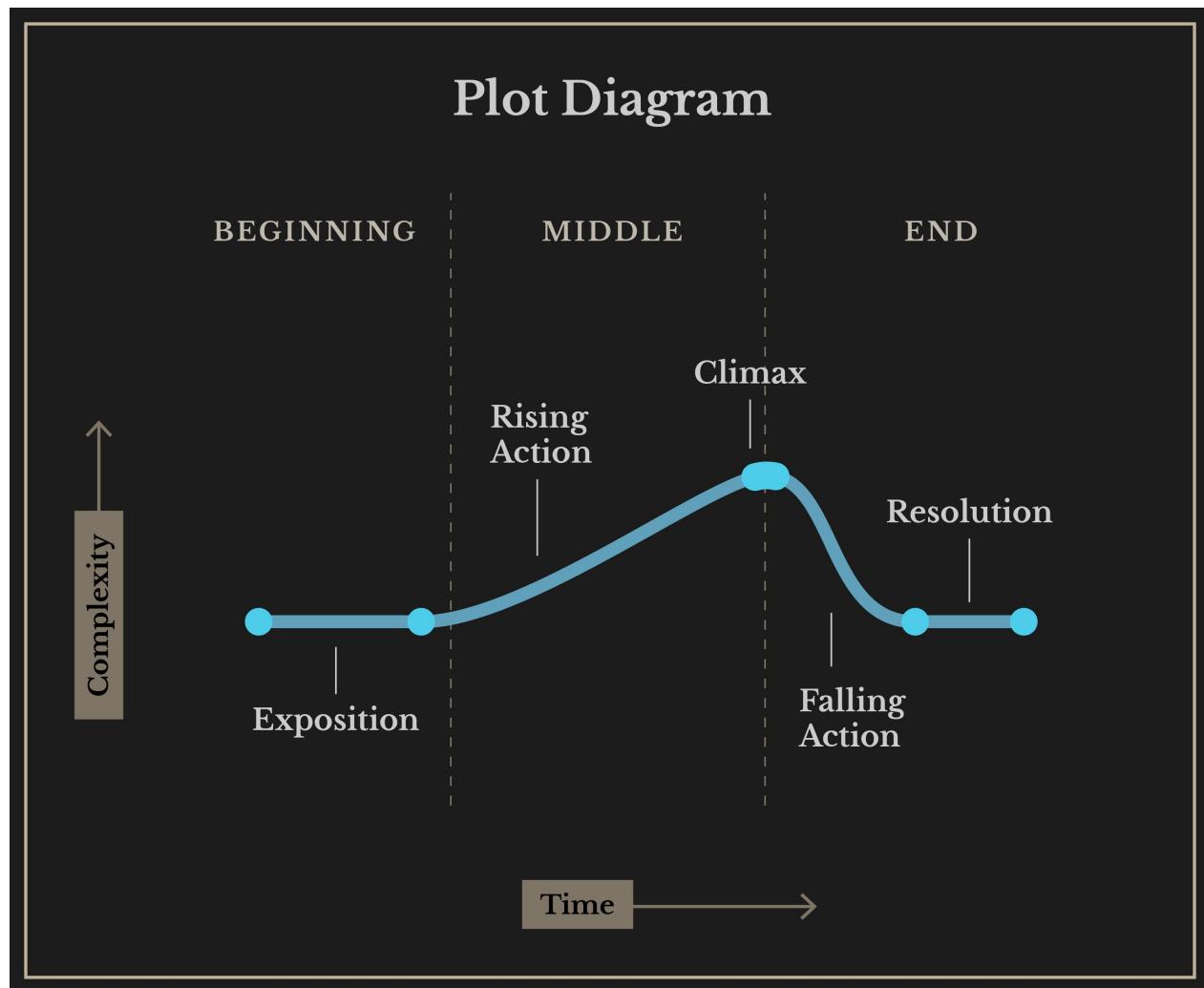
This five-act structure works well when describing Greek and Shakespearean plays. However, there are many ways to analyze the structure of a narrative. Most contemporary stories can be described with according to common structural breakdowns – the Three Act, Four Act, Five Act, Seven Act, and Hero's Journey. These structures can help us understand how a story is told, and act as a [heuristic](#) for writing your own story.

Three Act

1. Beginning
2. Middle
3. End

Three Act Plot Diagram

The following Plot Diagram shows the Five Act plot points laid over a Three Act structure.



Four Act

1. Inciting incident
2. First Act Turn to Second Act Turn
3. Second Act Turn to Third Act Turn
4. Third Act Turn to Resolution

Five Act

1. Exposition
2. Rising action
3. Climax
4. Falling action
5. Resolution

Seven Act

1. Backstory
2. Catalyst
3. Big event
4. Midpoint
5. Crisis
6. Climax
7. Realization

Hero's Journey

1. The ordinary world
2. Call to adventure
3. Refusal of the call
4. Meeting with the mentor
5. Crossing the threshold
6. Tests, allies, and enemies
7. Approach
8. The ordeal
9. The reward
10. The road back
11. The resurrection
12. Return with the elixir

Non-linear narrative structures

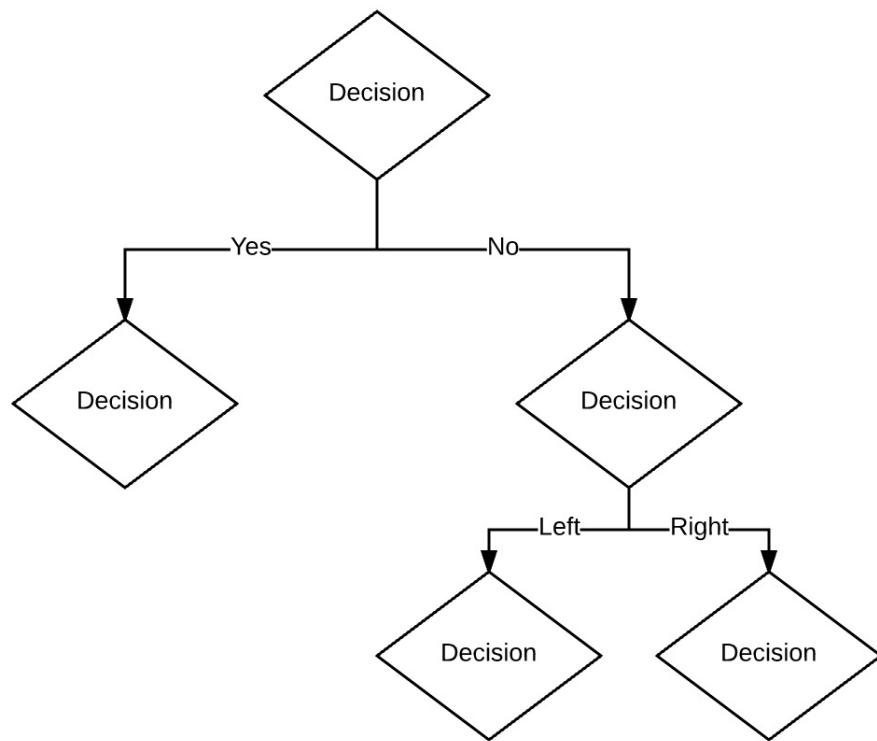
A non-linear structure is not necessarily chronological or cause-and-effect based. Story is unfolded simultaneously and recursively. Non-linear narratives are often used to create links between things that are otherwise not connected to create meaning or tension, a device used commonly in surrealism.

Interactive narrative

The story you experience in an interactive narrative work is not predetermined. The story path is chosen based on a viewer's choices. In video games, the number of story events that can be chosen through interaction can be quite high, making subsequent play-throughs unique. Newer games rely on generative algorithms and artificial intelligence to create the environment around these choices.

Decision nodes

An interactive narrative is comprised of decision or action points called nodes, where the user impacts the unfolding of the narrative by making a choice or performing an action. The choice the user makes can determine which branching narrative path is taken. The decisions themselves are part of the plot, which handles dramatization of the events.



For example, let's say you are playing a hypertext narrative, and your character is a young woman who sees a hooded figure shoplifting. The options to proceed include a) tell the shopkeeper, b) follow the shoplifter, or c) do nothing. Depending on which choice you select, the story will progress through one of three branching paths.

Critical story path

A critical story path can be thought of as the shortest path possible through a series of decision nodes to complete the interactive story.

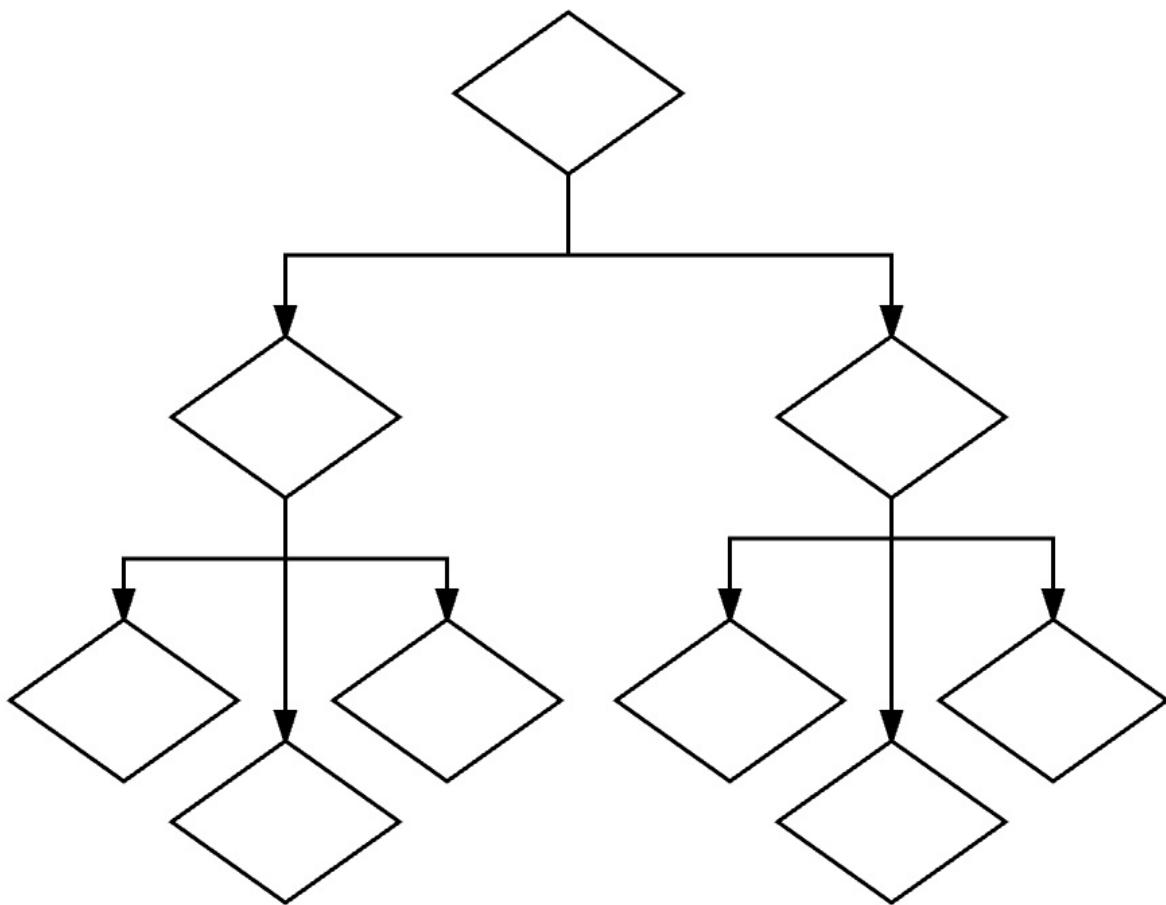
To develop the critical path:

1. All the critical story beats must be accounted for
2. Determine essential actions and decisions
3. Identify the optional narrative interactions that build around the central story

Linear narrative structural models

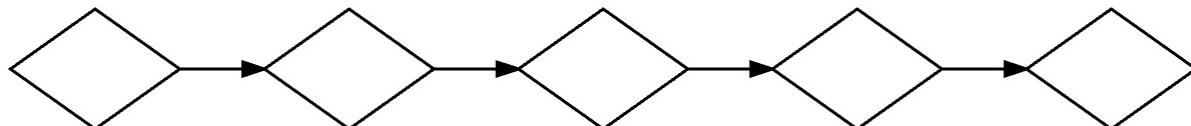
Branching

The branching structure is the structure used in "choose your own adventure" books and most interactive narratives. One problem with branching structures is the tendency to create overly complicated story paths.

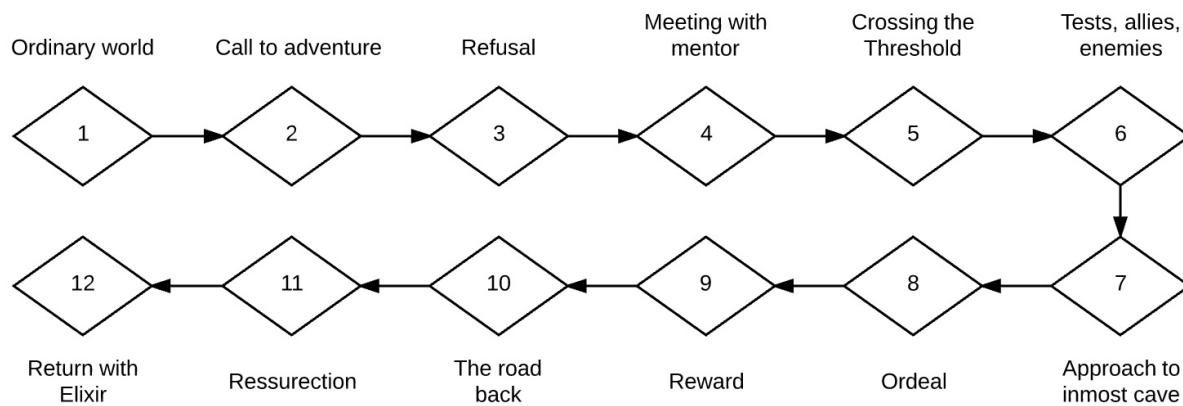


String of pearls

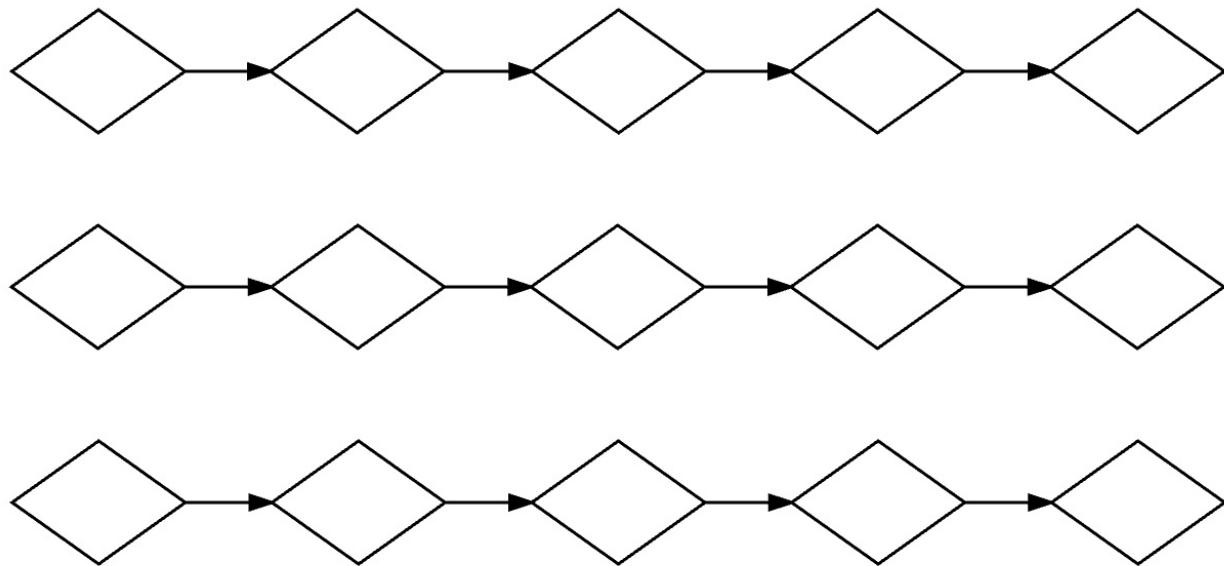
In this linear structure, a user must complete node's requirements to continue to the next node.



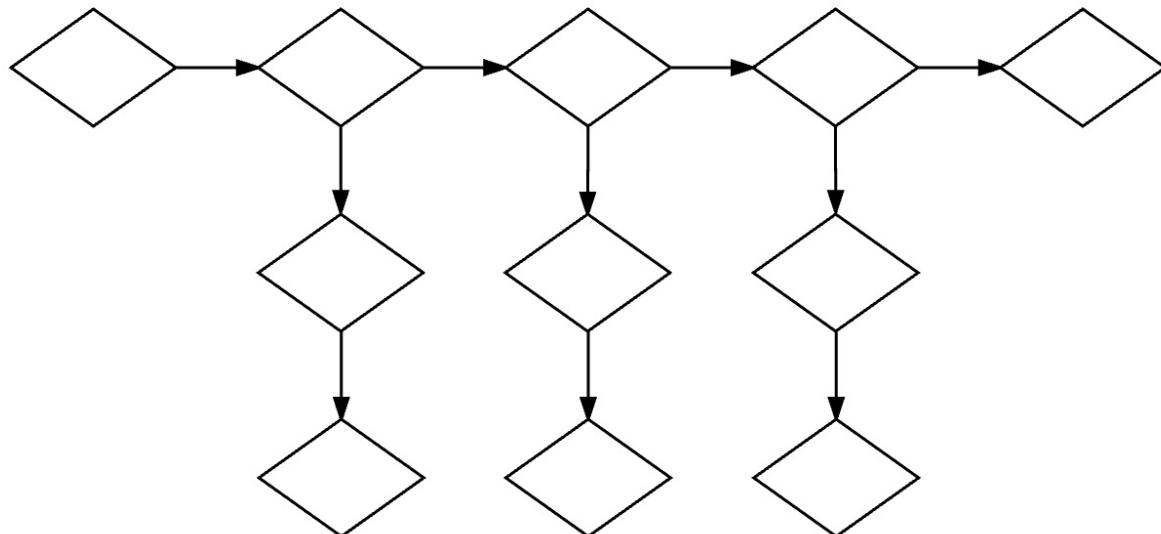
Hero's journey



In this linear structure, a user would follow the 12 stages of the hero's journey. However, there can be fewer or additional stages and still be considered a journey structure. Some stories continue around this path, creating a continuous.

Parallel worlds

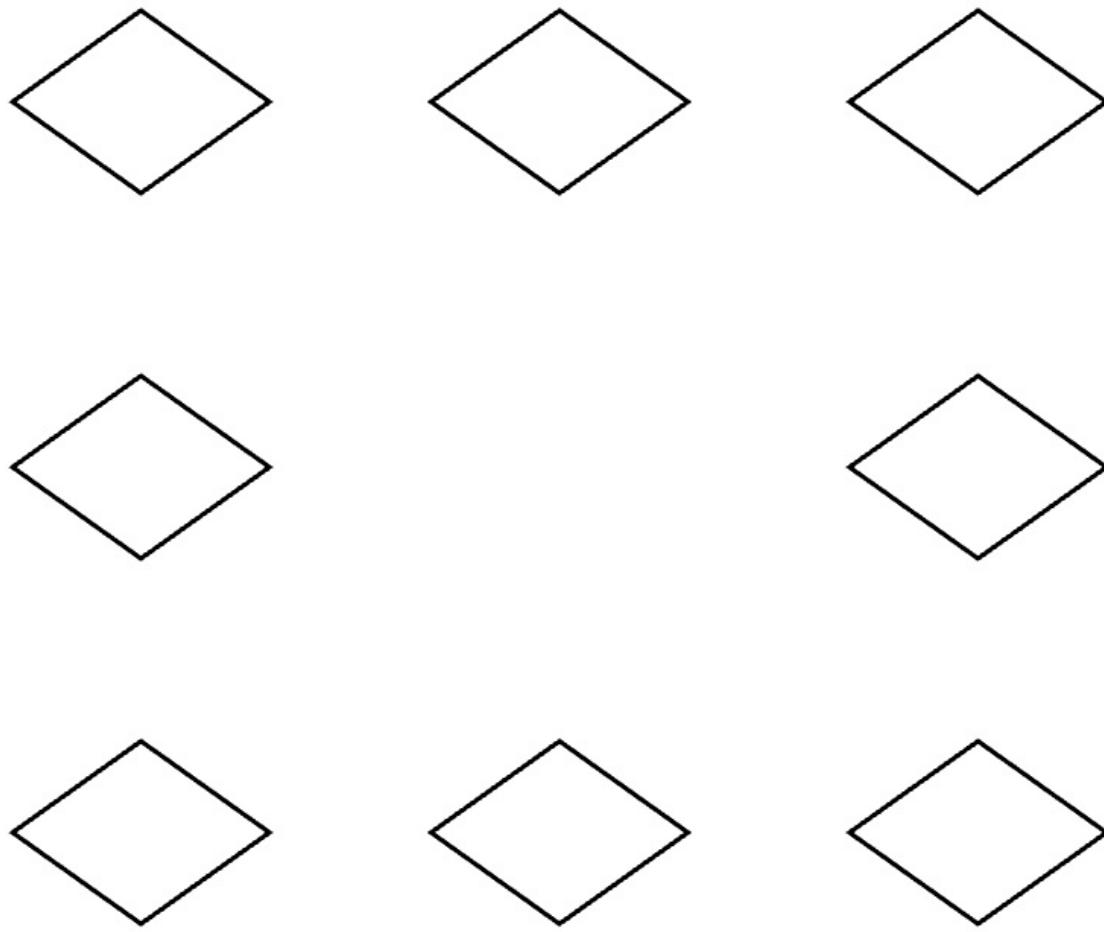
In this quasi-linear structure, users are given the opportunity to explore multiple storylines running in parallel. There is typically no way to experience all of the stories at once, though they may intersect at opportune times.

Drill-down

The drill-down is a bi-linear structure and encourages users to move through a story vertically and laterally, where lateral movement represents plot points and vertical movement represents gathering additional details about the plot.

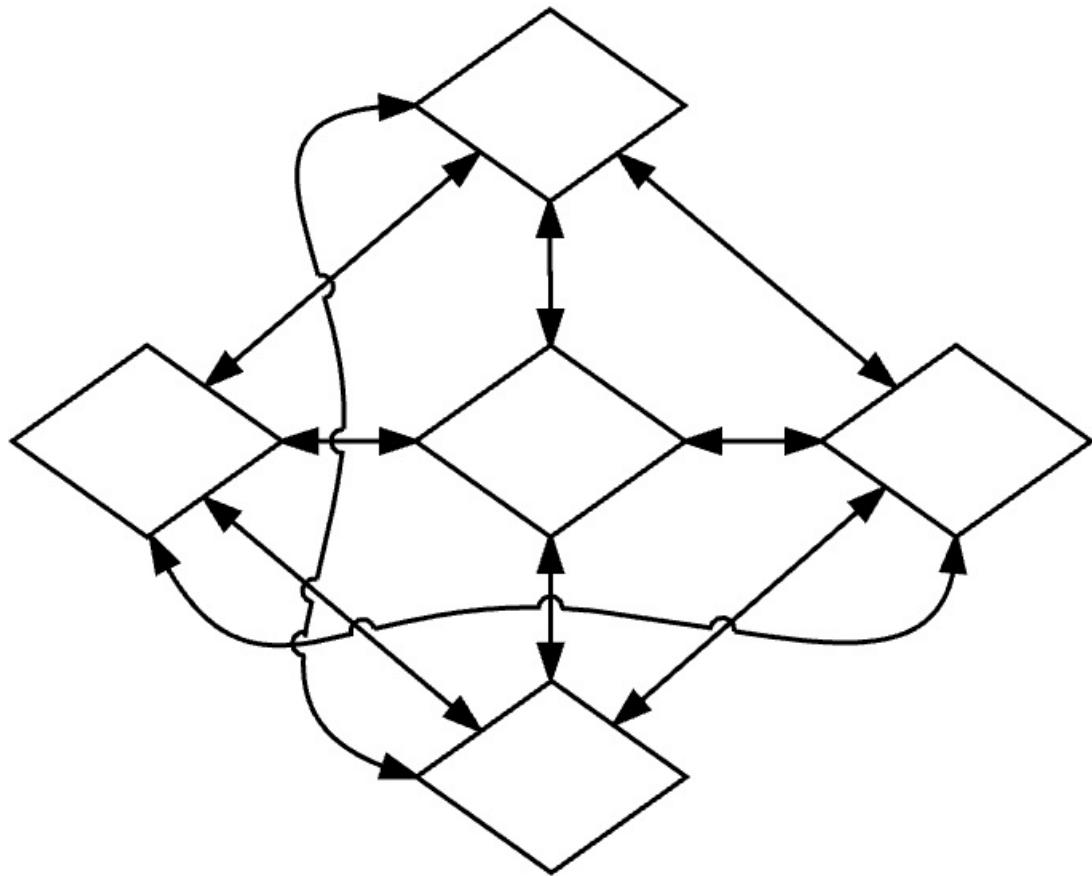
Non-linear structural models**Sandbox or open-world**

Open Environment



A sandbox structure is one where the story unfolds based on how a player chooses to interact in what is typically a large, open environment. This is a loose structure where the setting of the story often becomes central to the experience.

Graph



A graph structure is where all nodes simultaneously connect with every other node bi-directionally. Discerning a plot causality in such a structure can be difficult.

Creating your own structural model

Quite often, no perfect model exists for the kind of story that needs to be told. Part of the creative process for writing a narrative is producing the model that can best support the story.

Citation

1. [Digital Storytelling: A Creator's Guide to Interactive Entertainment](#). Carolyn Handler Miller. 2014. ISBN-10: 0415836948
2. [On Story, Plot, and Narrative in Games](#)
3. [There is no such thing as narrative art](#)

Story development

Story development is a generative process where ideas, themes, and unique characteristics tend to surface through [iteration](#) and reflection. It is also a technical process, where common elements are added, subtracted, combined, and transformed to convey meaning, encourage insights, and intensify excitement or tension.

Show, don't tell.

When drafting a story, it is often best to convey information and ideas indirectly. For instance, you could write, "Xavier was a very nice person." Alternatively, you could write, "Xavier spent his weekends volunteering at a local shelter and working part time as a nurse." Both methods communicate the kind of person Xavier is, but the latter is typically more engaging for the reader.

You can extrapolate this concept to practically everything you make. You want to let your viewers choose to connect the dots or leave some dots unconnected. If you don't give their brain any work to do, it can make for an extremely dull experience. Ask them to do too much work, and you risk giving them an experience that is confusing and frustrating.

Direct vs informed conversation:

When using direct conversation, a writer can more easily use the show don't tell method.

"Bob, stop that! I hate it when you do that!" yelled Linda.

This dialogue is an example of direct conversation, where we are shown that Linda is upset because Bob is doing something that she disapproves of. Alternatively, the audience can be told the same information like this:

"Linda yelled at Bob in a loud voice. She wanted him to stop and told Bob that she didn't approve of what he was doing."

Arguably, the direct conversation method is more engaging and can let us see the personality and emotion of the characters.

Audience

The audience is who are you writing the story for, and the way you put together the story elements should have your audience in mind. Story genre fan bases are essentially consumer markets. When a storyteller is complicit with fan service (fulfills the expectations of fans), it means they are catering to a market that buys a particular kind of story, which tend to be valued more by publishers as products rather than creative and expressive works. This exists heavily in literature, film, cartoons, video games, and other forms of media.

Story Elements

Setting/environment

The setting is the environment in which the story takes place. The setting helps establish the tone, story genre, and often foreshadows future events in the plot. In some video games, the environment is also a narrative device, providing context for the world the characters inhabit.

Point of View (PoV)

Who is telling the story? Who are you experiencing the story through? Depending on the point of view, the author can create a sense of intimacy with the story, or a more objective and distant perspective.

1. First person: (I, we)
2. Second person: (you)
3. Third person: (he, she, they)

Character

1. Assign characterization types to characters
2. Develop character profiles
3. Identify tropes to apply to characters or change characters to avoid unwanted tropes

Plot

1. Write critical beats (decision points)
 - Supports critical story path
 - Include elements:
 - The way it was
 - And then one day...
 - Raising the stakes
 - Moment of change
 - World as it is now
2. Write optional beats.
 - These become possible branches in your narrative.

Structure

1. Choose or design a structural model for the narrative.
 - The narrative structure should support critical story path and desired supplemental story interaction
 - If developing an interactive story, the structure might be on a dynamic scale between linear and non-linear. In games, cut scenes tend to be linear while gameplay and interaction tends to be non-linear.

Character

In fictional film or literature, character types are used to help viewers to empathize with the story. A person's character typically refers to the qualities they possess. However, a character can also be an animal, object, or abstraction in a story. Objects are often represented through anthropomorphism, where human attributes are applied to a non-human. According to an [explainer video about animated light](#) for the movie, *Akira*, the city itself was considered to be a character. Other examples of non-human characters include Lightning McQueen from [Cars \(2006\)](#) and a homicidal car tire named Robert in the movie [Rubber \(2010\)](#).

Characterization

In the process of characterization, a writer will construct traits of a character according to how they will serve the story's plot requirements. Characters are often inspired by people from real life, but often become simplified, combined, and adapted as needed.

See [tv tropes.org wiki](#) for an expansive collection of characterization tropes.

Types (tropes) in fictional stories

Character types are often one or a combination of the following:

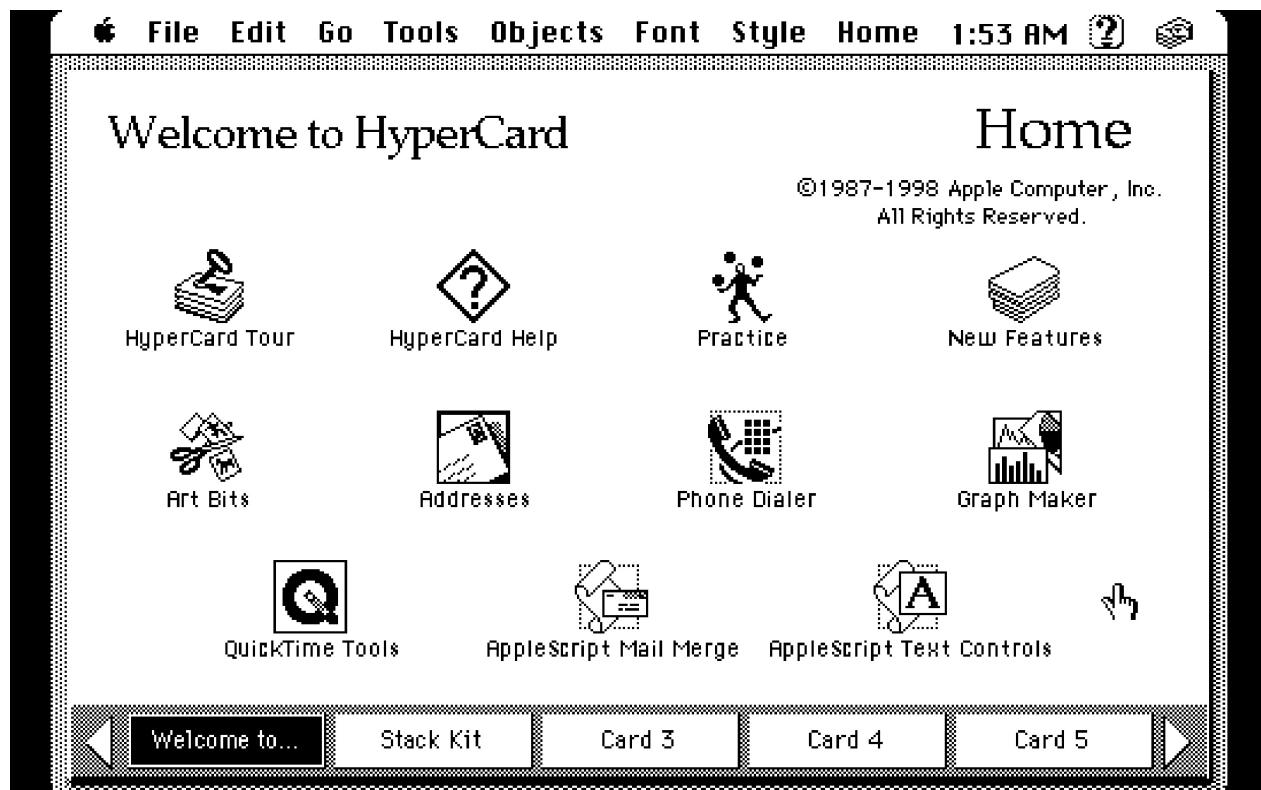
1. **Main character:** We experience the story through this character's eyes.
2. **Supporting character:** These characters help us understand the main character, advance the story.
3. **Protagonist character:** The story typically follows this character most closely. They are needed to resolve the conflict and typically have heroic qualities.
4. **Antagonist character:** Tries to prevent the story goal. Opposes the protagonist.
5. **Dynamic character:** Shows development and change over time.
6. **Static character:** Does not develop or change over time.
7. **Anti-hero character:** Protagonist who lacks heroic qualities.
8. **Round character:** Well developed, complex, sometimes contradictory traits.
9. **Flat character:** Not well developed, static.
10. **Stock character:** Archetypal, stereotypical, and flat.
11. **Foil character:** Typically contrasts the main character in qualities and values so that we may learn more about the main character.
12. **Symbolic character:** This character represents an abstract concept like "hope" or "justice."

Character profiling

Creating a character profile is helpful to describe the way in which a character connects with and supports the telling of a story.

1. Importance to story
 - What role does the character play?
 - Characterization types
2. Physical attributes
 - Name, age, gender
 - Markings, tattoos
 - Abilities, disabilities
 - Race/ethnicity
3. Inner struggle and journey
 - What motivates the character?
 - What does the character want more than anything?
 - What do they fear most?
 - How do they hide their true selves from the world?

- What would they want to be remembered for?
 - What do they learn by the end of the story?
4. Personality
- Unique trait
 - Strengths
 - Weaknesses
 - Critical flaw that impacts the story
 - Behaviors and actions
 - Back story that explains why they are this way
5. Story interaction
- Internal conflicts
 - External conflicts
 - Meetings with other characters
 - How are character flaws introduced into the story?



Narrative media

A medium is a carrier or vehicle of stuff, and in the case of creative work, concepts, ideas, and other expressions. If you are standing next to a person, and would like to communicate something you are thinking to them, you would simply use verbal communication, assuming you both spoke the same language. For a very long time, this was the main way humans communicated. Over time, people discovered that they could convey ideas without having to be physically present for the communication to take place. Written language allowed people to communicate an idea repeatedly, to different people, without having to be there.

Fast forward to now, digital formats now afford people communicate across the planet by talking into a box that fits into the palm of your hand. [Some are working on brain interfaces](#) so that communication of thoughts can happen automatically and without the possible constraints imposed by spoken and written language.

Transmedia

Transmedia is communication of ideas and experiences through multiple mediums. But what exactly is a medium?

A medium is a carrier or vehicle of stuff, and in the case of creative work, concepts, ideas, and other expressions. If you are standing next to a person, and would like to communicate something you are thinking to them, you would simply use verbal communication, assuming you both spoke the same language. For a very long time, this was the main way humans communicated. Over time, people discovered that they could convey ideas without having to be physically present for the communication to take place. Written language allowed people to communicate an idea repeatedly, to different people, without having to be there.

Fast forward to now, we can use different media simultaneously to communicate. When one thing is being communicated across media, this is called Transmedia. Typically, each medium used adds to, expands, contextualizes content in different ways in a non-linear fashion.

Unlike single-source media, **transmedia** refers to the idea that a narrative is communicated and experienced across multiple forms of media. A good example of a transmedia narrative project is documented in the film, [The Institute \(2013\)](#). In the film, fictional and non-fiction stories unfold through a wide array of media including paper fliers, physical installations and puzzles, radio programs, organized events, video recordings, phone calls, and others.

Interactive media

Interactive media is communication that you can influence or control in some way. In some cases, the viewer becomes the co-author of the communication by adding their own content. One of the most notable examples of interactive fiction is video games. Most, but not all, video games follow linear stories where players perform actions to move the story forward.

Examples

- <http://playspent.org/>

Hypertext

An early computing pioneer, Theodor H. Nelson, summed up hypertext as this: "by hypertext, I mean non-sequential writing—text that branches and allows choices to the reader, best read at an interactive screen. As popularly conceived, this is a series of text chunks connected by links, which offer the reader different pathways."

CERN officially put the World Wide Web (WWW), developed by British Scientist Tim Berners-Lee, [into the public domain on 30 April, 1993](#). The WWW, or simply "Web," allows for the use of Hyper Text Transfer Protocol (HTTP) to quickly and reliably retrieve and distribute information between a Web Browser and a Web Server.

Not long after, people started using hypertext as a means to tell both linear and non-linear stories, called hypertext narratives. Before the introduction of the Web, hypertext fictions were first published using desktop software such as [Storyspace](#) and [Hypercard](#). Afternoon, written by Michael Joyce in 1987 and published by [Eastgate Systems](#) in 1991, is considered one of the first hypertext fictions. Hypertext fiction confronts readers with nodes of text; decision points where they use hypertext links to navigate to other nodes. Because the order in which the story is revealed will depend on reader choices, reader becomes—in a sense—co-author. The concept of linked nodes of content has extended past text-based media to multimedia objects called hypermedia.

Giorgio Vasari and the Permutations of Design

Giorgio Vasari and the Permutations of Design (p. 85-87) in Design and Truth by Robert Grudin

Writing prompt

In this chapter, Grudin explores implications resulting from Vasari helping to establish the Accademia del Disegno in 1563. What were the results of this university's approach to design?

Do you think the approach might have impacted the world into the 21st century? If not, why? If so, what are current examples of the impact or parallels to Vasari's conception of art and design?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

The Lady in the Picture: Design and Revelation in Renaissance Art

The Lady in the Picture: Design and Revelation in Renaissance Art (p. 88-104) in Design and Truth by Robert Grudin

Writing prompt

In this chapter, Grudin gives us a glimpse into specific moments of knowledge design during the Renaissance through examining paintings, architecture, writing, and opera. I encourage you to look up the works referenced in the passages as you read to visualize them.

What distinctive characteristics does Grudin highlight to support his argument that these works are examples of **knowledge design**? With those examples in mind, can you relate them to specific pieces of contemporary creative work that succeed or fail to embed knowledge? Describe specific visual details and how they relate to the work's function in society or the creator's perspective.

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

In Jefferson's Footsteps: Modes of Self-Design

In Jefferson's Footsteps: Modes of Self-Design (p. 105-116) in Design and Truth by Robert Grudin.

Writing prompt

In this chapter, Grudin talks briefly about humanity's departure from synergy with the natural world through the rise in urbanism and the relationship of normative social structure on free expression, free inquiry, and free enterprise. He also highlights the underlying humanist attitudes that propelled Thomas Jefferson and Niccolò Machiavelli to great accomplishment and segues into lessons on self-design.

Grudin suggests that a 40 hour work week is not a universally applicable working paradigm, and that designing an intentional day to include mechanisms of growth can teach us each to expand our own nature. For this writing prompt, I would like you to examine what Grudin means by self-design and to design your own **Intentional Day Schedule**. What would be in your day? What mechanisms of growth would you include? How would you balance social and work interactions? Be specific!

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Creative Mornings: Jordan Tannahill

Jordan Tannahill discusses storytelling and ethics related to misrepresentation and exploitation.

[Creative Mornings: Jordan Tannahill \(38:57\)](#)

Andrew Stanton: The clues to a great story

In this TED talk, Andrew Stanton talks about what makes us care about stories and how young Pixar storytellers rebelled against the rules.

[Andrew Stanton: The clues to a great story \(19:09\) \(Explicit\)](#)

99 Percent Invisible: Of mice and men

Doug Engelbart wanted to build computer interfaces that required users to master the tools, much like a musical instrument. Listen to this 99 Percent Invisible Podcast on how Doug Engelbart's work on computers influenced modern computer interactions.

[Of mice and men \(20:05\)](#)

Hypertext Narrative Project: Civic Imagination



Brief

For this project, you will create a fictional hypertext fiction with an open-source application called Twine focused on building a better future world, set in the year 2047. The main goal of this project is to create **plausible**, civic-minded design patterns for improving the future. A hypertext fiction is a fictional story that is read by progressing through a series of story nodes containing hypertext links, with each link leading to another node in the story. You will follow a design process that will help you generate ideas, create characters and plot, incorporate feedback, and iterate towards a final work.

Tools and materials

- Pencil/pen
- Journal
- Computer with Internet access
- Twine Desktop Application

Learning Resources

Instructor produced:

- Twine Tutorial: [Getting Started](#)

You should include the bare minimum listed in this tutorial, but if you want to produce a more advanced hypertext narrative, see the [Twine Wiki](#) for more details.

From the Twine community:

- Twine Guide: [Twine Wiki](#)
- Advanced: [Interactive Fiction](#)
- Making a game with Twine: [Twine Game Tutorial](#)
- How to add [custom CSS](#) to a Twine story (colors, fonts, layout, etc.)

Inspiration

- [Fabricationist DeWit Remakes the World by Jedediah Berry](#)
- [Eidolon by A.D. Jansen](#)
- [Science Fiction Prototypes by the Threatcasting Lab](#) — Short comics illustrating potential technological futures relevant to the military.

Previous student work

"Love to Evolution" by Symphony Howlett, 2017

Grading

This project will be graded according to a cumulative assessment of each part of the design process. More information can be found on the individual design process step.

Citation

This project has been adapted from: THINK CRITICALLY - ACT CREATIVELY: HARNESSING THE POWER OF FICTION FOR SOCIAL GOOD. Accessed on October 10, 2016. <http://byanymedia.org/works/mapp/activity-1?path=activities>

Further reading and relevant work

[Fabricationist DeWit Remakes the World](#) by Jedediah Berry is an interactive SciFi story created with Twitch and featuring original music. The story details a "synthetic being who, after a sleep of centuries, receives an unexpected visitor"

[Eidolon by A.D. Jansen](#) is another Twitch-based interactive story, including hyperlinks connecting the pages.

The U.S. Army Cyber Institute produced a series of [Science Fiction Prototypes by their Threatcasting Lab](#) written by futurist Brian David Johnson. These short comics illustrate potential technological futures relevant to the military. Most science fiction is written for the public at large, so it's interesting to see these functional narratives developed for strategic research.

Hero download: [Hero_high-res.pdf](#)

If you haven't watched [Black Mirror](#) on Netflix, the anthology show by Charlie Booker is one of the premiere examples of speculative fiction and technology (things usually don't end well for the users of said technology).

But since this project asks you to design a better world, let's look at an example of technological utopia. *Black Panther* (2018) was a groundbreaking film for many reasons, one of which was its portrayal of an afrofuturist society in mainstream pop culture.

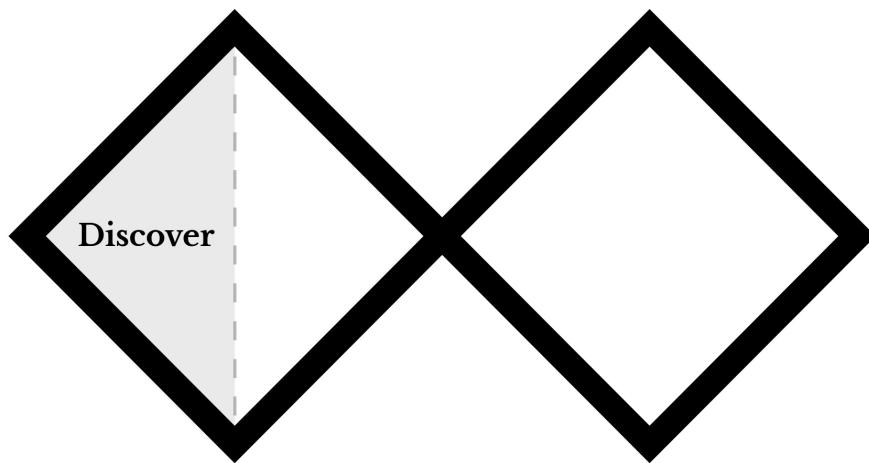
Afrofuturism is a genre of literature, philosophy, art, and design, that extrapolates African cultures into the future, upending the typically Eurocentric vision of the future. This article is a good roundup of [Afrofuturist architecture and design products](#), but it's worth reading this [CityLab interview with Black Panther production designer Hannah Beachler](#).

Beachler and her colleagues designed the entire capital city of Wakanda for *Black Panther* including a 500 page "Wakanda bible" that detailed the nation's history and technology. In the interview, she describes how "she emphasized human connection in her design" by focusing on public transit instead of cars and putting cultural identity on display.

What other cultures or locations can you bring thirty years into the future? What problems do you wish could be solved? What technology would revolutionize your surroundings?

Previous student work

"Love to Evolution" by Symphony Howlett, 2017



Discover: Word-pairs

Materials

1. Pen or pencil
2. Journal

Instructions

Please allow at least 60-75 minutes to complete this activity.

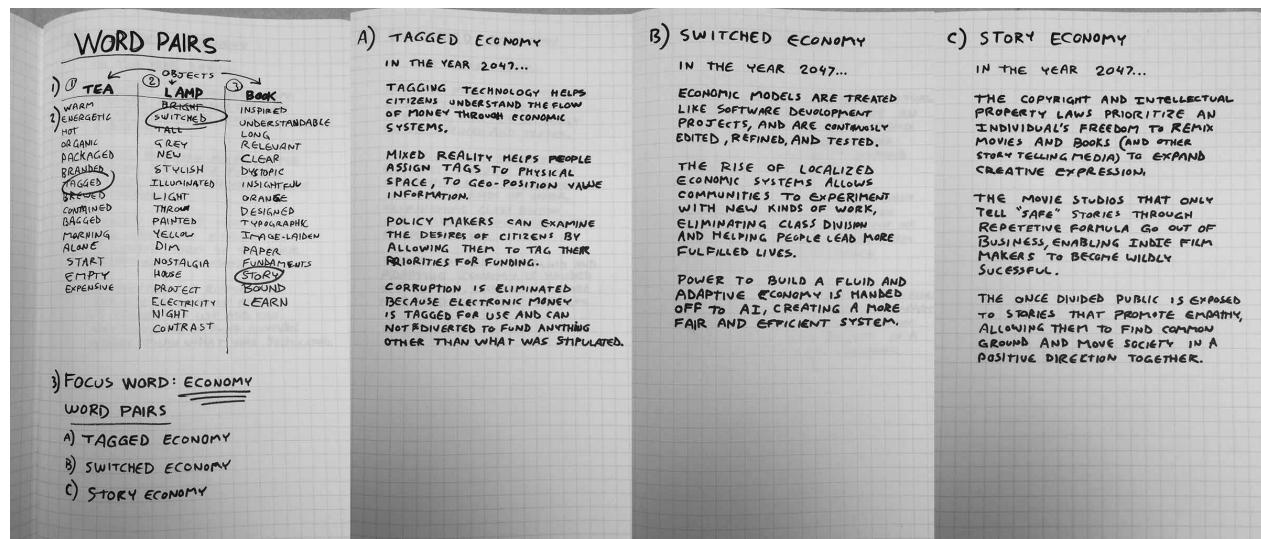
1. In your journal, write three objects from your home. If you cannot think of any, choose three objects from a random object generator. Here is [one](#).
2. Free association writing (10 mins)
 - On a journal page, write as many words about each object as you can.
 - When you are done, circle any **three** words.
3. Choose **one** focus word from the list below. Write the adjectives circled from the previous step in front of your chosen focus word, creating three word-pairs (I.E. - if you choose education, you would combine your adjectives with only education):
 - education
 - economy
 - health
 - wellness
 - transportation
 - technology
 - government
 - freedom
 - justice
 - democracy
 - business
 - trade
 - environment
 - food

- o agriculture
- o ecosystem
- o energy
- o labor

4. Now that you have created three word-pairs, write each one onto a separate journal page.

o Think about important contemporary issues. Now imagine 30 years into the future and an ideal or positive situation

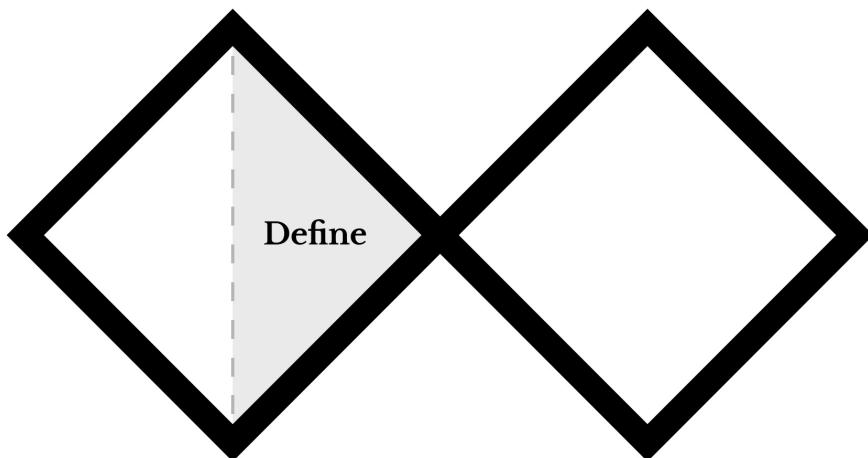
has occurred, inspired by the word-pair (IE - if it's 2020, think forward to 2050). Think of one-sentence descriptions to explain the scenario. It is okay to take inspiration for your ideas from current events, film, books, news, personal experiences, etc. Write as many responses per word-pairs as you can (at minimum, two per word-pair). Limit yourself to 30 minutes.



Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload photos or scans of your journal pages in .jpg or .png format. Make sure that your documentation images are clear and readable.



Define: Synopsis

In this activity, you will create a short synopsis sentence to guide a fictional, yet **plausible** story narrative.

Aliens - possible, but NOT plausible

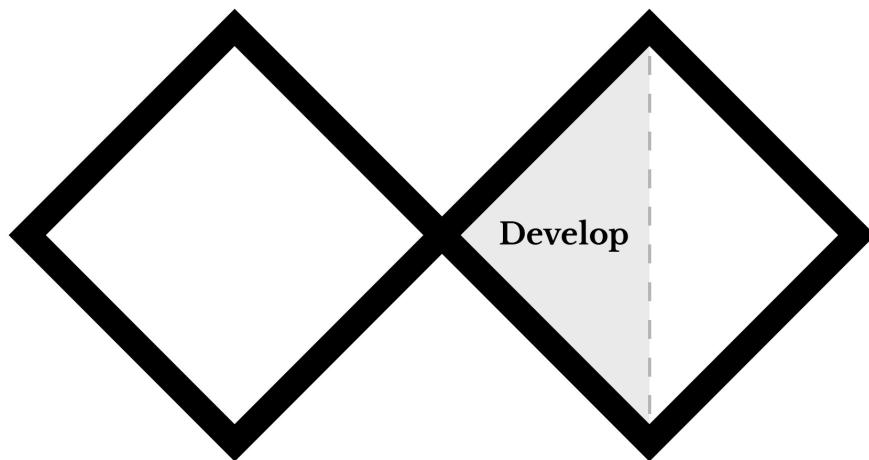
Instructions

1. Read through the one-sentence descriptions from the word-pair activity and choose the one that sounds the most interesting to you.
2. Re-write the chosen description as a short sentence that explains the way it *was* in **(this year)**, and the way it *is* 30 years later in 20xx. "**In the year 2017 (the way it was), but now in 2047 (how it's better world).**" An example sentence would be: *"In 2017, the Earth's wildlife was experiencing a high rate of extinction, but now in 2047 almost all of the world's endangered wildlife species are back to healthy populations."*

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Write the sentence in the assignment submission text box. Do not upload a file of any kind.



Develop: Story and plot elements

You will now write a fictional, yet **plausible** story that describes how this imagined future 30 years from now came to be. For example, Unicorns are not plausible to exist in 30 years (unless you make a compelling CRISPR argument), but autonomous flying cars are plausible.

The story should describe the evolution of the world as it is now to the world 30 years in the future, using characters and dramatic story structure.

Requirements

- **Positive content:** The result of the plot must be of a positive future.
- **Plausible:** The story must be in the realm of technological and scientific plausibility.
- **Conduct research:** Find articles or books that help support the plausible nature of story. For instance, if some new technology is being used, find credible sources that help support its use in your story.

Document guidelines

Produce a document with the following items:

1. **Your name**
2. **Date**
3. **Title:** Story and plot elements
4. **Synopsis sentence**
 - Write your synopsis sentence here.
5. **Story genre**
 - In what genre would you like to tell the story? **Ensure that the genre supports a story that is plausible and results in a positive future.** Avoid fantasy, tragedy, dystopian, and erotica genres. There is an enormous variety of fiction genres. Start with the links below, and investigate further as needed:
 - **Wikipedia:** [List of writing genres](#)
 - [35 Genres and Other Varieties of Fiction](#)
6. **Narrative tropes**
 - Search through this [list of narrative tropes](#) to identify ones you are interested in using. Choose three or more tropes and write

a short description for each.

7. Settings and environment

- Describe the sights, sounds, smells, etc. In what location are the characters?

8. Bibliography

- List any articles, books, websites, or other sources used in your topic research. Use a [citation generator](#) to create citations in either APA or MLA format.

9. Character list

- List the people who would need to see this story in order for it to become a reality? Who are the decision makers that can make this happen? Who are the organizers, supporters, proponents, and opponents? These people are your characters. Read the [character topic](#) for more details.

10. Plot structure

- i. The way it was
- ii. And then one day...
- iii. Raising the stakes
- iv. Moment of change
- v. World as it is now

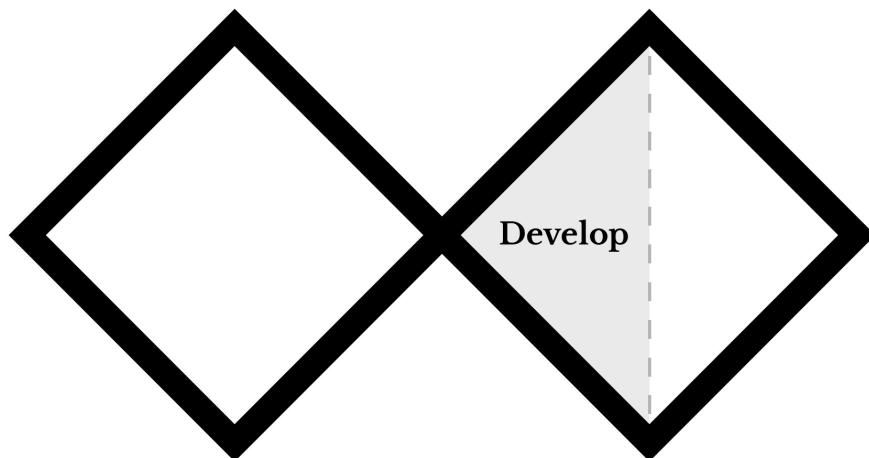
Document instructions

1. Make a new text document in `.doc` format.
2. Write the document according the document guidelines.
3. Double-check that you've met all other listed requirements.

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Follow the document instructions.
2. Upload the plot document in `.doc` format.



Develop: Characters

Tools

- Pen or pencil
- Download: [Characterization Sheet](#)
- Printer
- Scanner or camera

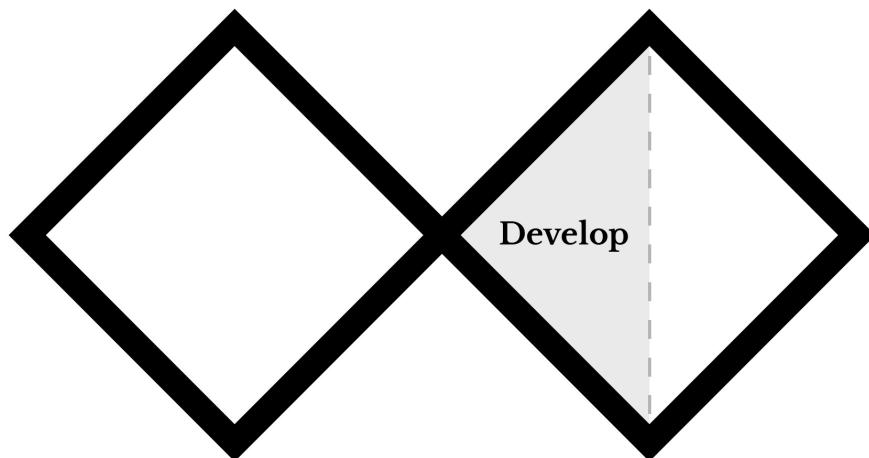
Instructions

1. In Synopsis activity, you listed [characters](#) that would be involved in the story. Using your list as a starting point, find images and articles of people (or objects) to base your characters on. You can combine attributes of character references together to create your own characters.
2. Fill out a [Characterization Sheet](#) for each character in your story.
3. Scan or photograph your worksheets

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload the finished characterization sheets in `.jpg` , `.png` , or `.pdf` format.



Develop: Hypertext narrative (draft 1)

In this phase, you will use a tool called Twine to create an interactive narrative from your latest narrative draft. Twine allows you to create linked decision nodes, similar to a "choose your own adventure" book where you can follow different story paths. Twine is available as a downloadable app for Linux, OSX, and Windows, or as an online editor located at twinery.org/2. You can use either to complete this project, but you will need to submit the compiled HTML story file.

Learning resources

Twine Tutorial: [Getting started with Twine](#)

Story requirements

1. **Your story must have a title.** "Untitled" is an acceptable title. "My class project" or something similar is not an acceptable title unless the content of the story is actually about a class project.
2. You must have a minimum of **five critical pathway nodes** (events). These nodes can correspond to the plot structure, however, this is not required. Your narrative should take a viewer no longer than 10 minutes to get through the critical pathway.
3. **Branching nodes are optional.** You can use branching nodes to elaborate on backstory, settings, drill-downs into characters, to explore sub plots, and anything else you think would be interesting and contribute to the telling of the narrative.
4. These are the baseline requirements. If you wish to develop the story using Twine's javascript capabilities, and more tightly control the visual look and feel with CSS styling, that is great. However, it is not expected since this is not a web development project. The story is the priority.

Instructions

1. Use the Twine application to create a hypertext narrative from the story and plot elements that you wrote in the develop phase of the project. You may choose to write the story in a traditional word processor and paste text into Twine.
2. Follow the Twine Tutorial to learn how to create a linear hypertext narrative.
3. You can add as many supporting events or nodes as you want. If you are unsure of what type of story to produce, start with a linear narrative model. Refer back to the topic on story structure for more information.

4. [Publish the Twine story](#) to an HTML file.

Post work

Submit a `.html` file by following the instructions above. You must obtain prior approval to deviate from these upload requirements.

- Upload the `.html` file to studio.
- Alternatively, you may create a `.zip` archive containing the `.html` file, and upload the `.zip` file to studio.

IMPORTANT: Make sure the file you submit to Studio is a `.html` file. It should not be a public web URL (`https://...`) or a local filepath (`user:///...`)

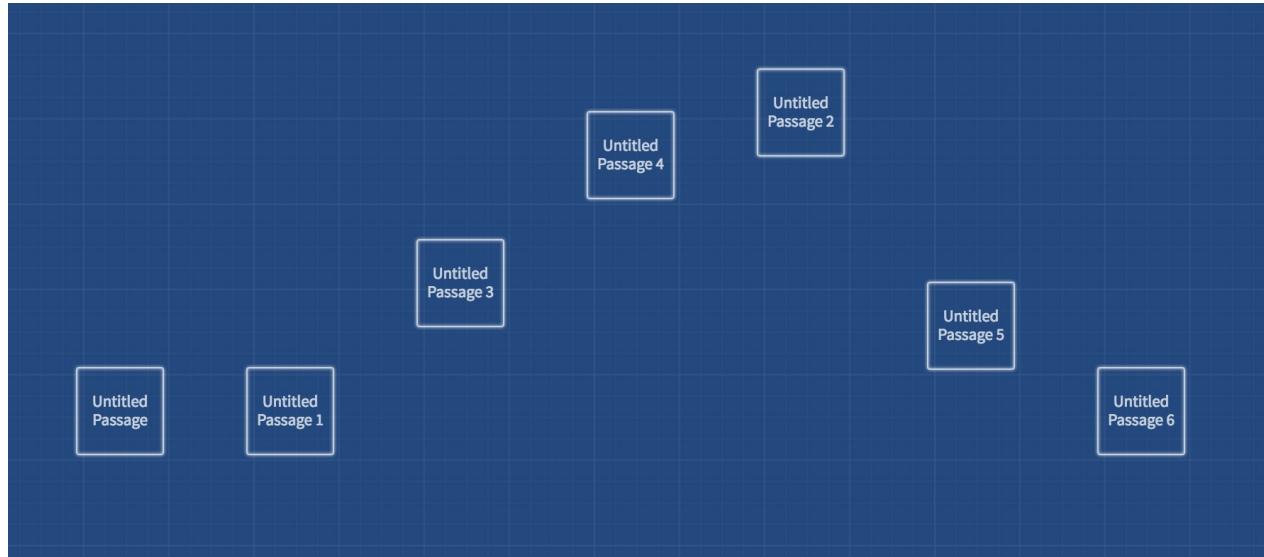
Twine tutorial: Getting started with Twine

In this tutorial, you will be guided through the steps to create a simple hypertext Twine story.

Creating linked passages

1. Go to <https://twinery.org/>.
2. Click on **Use it online**.
3. Add a new story and give it a name.
 - o If you've done this correctly, a blue grid will appear with an example passage.
4. Double click on **Untitled Passage** to go into edit mode.
5. Rename **Untitled Passage** to **Start**.
6. Type the following text into the body: I had my head in, and was about to open the lantern, when my thumb slipped upon the tin fastening, and the old man sprang up in bed, crying out: [[Who's there?]]
7. Press escape or click the x to close edit mode.
 - o You will see that a new passage has been created automatically called "**Who's there?**"
 - o The untitled passage should now be named **Start**.
8. Double click on "**Who's there?**" to go into edit mode.
9. Type the following text into the body: I kept quite still and said nothing. For a whole hour I did not move a muscle, and in the meantime I did not hear him lie down. He was still sitting up in the bed listening;--just as I have done, night after night, hearkening to the death watches in the wall. [[Go Back|Start]]
10. Press escape or click the x to close edit mode.
11. Press the Play button to test the story.
12. Publish the story to HTML by clicking on the story's name at the bottom left and choosing publish from the menu.

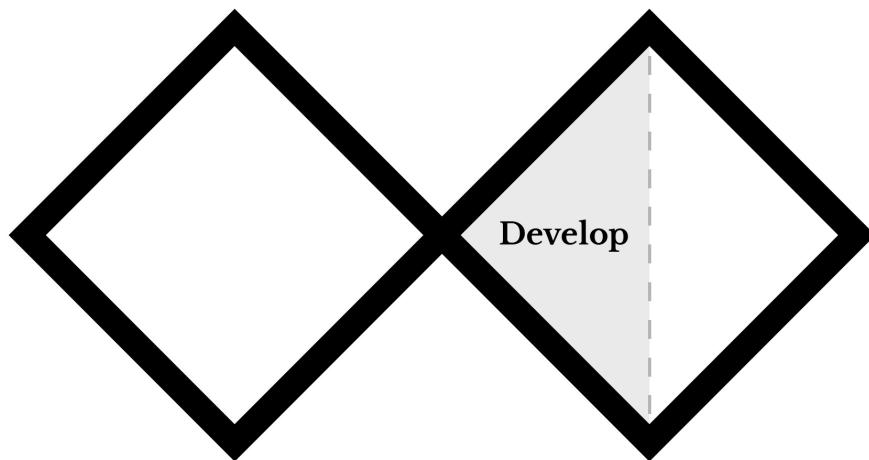
Using Twinery's grid to visualize a the story's shape



1. Write out the main plot points of the story on paper or a text editor.
2. In [Twinery.org's editor](#), create a new passage for each major plot point horizontally across the screen.
3. Move the passages vertically up and down to create a visualization for rising and falling action. If you run out of space on the screen, you can decrease the size of the grid by choosing one of the other grid/block icons on the bottom menu bar.



4. Edit each passage and write in the passage details and links.
5. Read through your story to see if the plot points match the intended rising and falling action. Make adjustments accordingly.



Develop: Feedback

You will now evaluate assigned peer work and provide feedback.

Peer Feedback Guidelines

1. Write the URL to the Twine story
2. Include the following feedback.

For this task, we will use Feldman's Model for criticism of creative works. Please use the following criteria to guide your feedback:

1. Description
 - i. Who/what are the characters in the story?
 - ii. What is occurring in the story?
 - iii. In what Point of View (PoV) is the story being narrated?
 - iv. Are there any tropes or techniques that you can identify?
 - Narrative tropes
 - Narrative techniques
 - v. What is the setting or environment?
 - vi. What else did you notice?
2. Analysis
 - i. How is interest created?
 - ii. Where are the moments of dramatic tension?
 - iii. Does the story use the "show, don't tell" principle?
3. Interpretation
 - i. In general, how did the story make you feel?
 - ii. Was the story about a positive future? How do you know?
 - iii. What themes emerged in the story?
 - iv. Who do you think the audience is?
4. Judgement
 - i. How well do you think the story is working?
 - ii. Does the story meet the requirements of the project?
 - iii. What could be done to make the story better?

Instructions

1. Write feedback for your assigned draft(s) according to the Peer Feedback Guidelines. Your group assignments are located on Canvas.

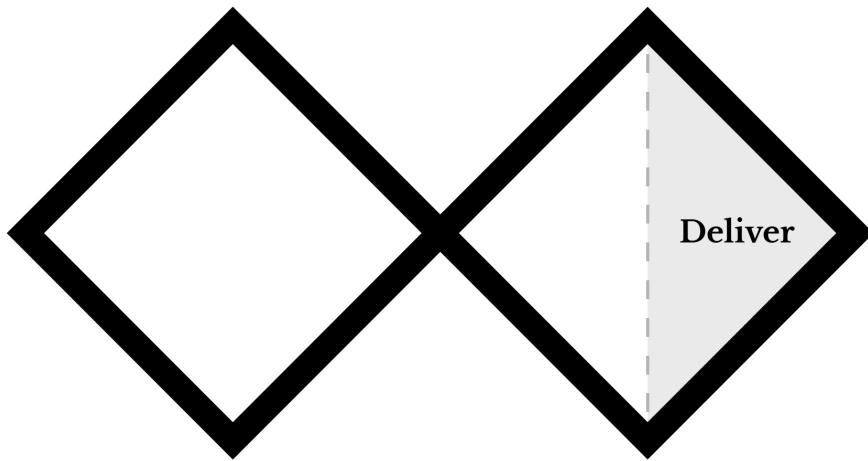
Troubleshooting:

- You must download submissions to view them; right-click on the submitted file and choose "Save as."
- If the person's submitted file is not a .html or .zip file, they may have submitted the project incorrectly and you should notify them or explain the issue to your instructor.
- If you have trouble unzipping the story file, please use a more powerful unzipping tool. See [this tool for Mac](#) and [this tool for Windows](#).

Post work

Use the indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Post the corresponding feedback to your assigned feedback group member's assignment submission as a **comment** in Studio.
2. Combine all the feedback you've written and upload to this assignment's submission text field or upload an MS Word document.



Deliver: Hypertext narrative (draft 2)

Iterative improvement is the key to good design. Now that you have peer feedback, tweak, change, and improve your work. Re-read your story and identify where you might be able to further develop characters, increase tension and drama, introduce dialogue, alter story pacing, smooth out awkward transitions, etc.

In this draft, consider the role of style and emerging techniques in your narrative. See examples [here](#).

Consider the following questions:

- Is there a strong organizational structure to your story?
- Do the characters have motivations, challenges, and arcs?
- Is the technology or change you're inventing described in convincing detail?
- Is the story too long? Too short? Does every sentence matter?

Instructions

1. Review your feedback for the hypertext narrative.
 - i. If you are unsure about how feedback works, please see these [guidelines](#).
2. Reflect on how your work can be improved. Analyze, interpret, and apply relevant feedback to improve the project.
3. Record the changes that you made to the hypertext narrative.
4. Publish the HTML file.

Optional CSS Styling

As you finalize your story, you may use this time to customize the appearance of your Twine pages using CSS—the declarative programming language used in web development.

This is an optional step, but it's a great skill to learn if you're interested in web design and a fun way to personalize your story's look.

Resources:

- [How to add custom CSS to a Twine project](#)
- [Tutorial on using the DevTools Inspector in Google Chrome](#) — Inspect elements in your Twine pages to figure out how to target

them in CSS

- [Basic tutorial on customizing a page with CSS](#)
- [Interneting is Hard](#) — comprehensive tutorials about HTML and CSS
- [General CSS reference from Mozilla](#)

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. **Change Log:** Upload a short description about the changes and improvements that were made in `changelog.doc` format.
2. **HTML:** Upload the exported Twine `.html` file (or `.zip` file if you have multiple assets).

THE PROFESSIONAL DESIGNER WILL
BECOME AN AGENT OF DESIGN,
WITH THE AUDIENCE OF END USERS
SELECTING WHICH DESIGNER'S
SYSTEM THEY WISH TO EMPLOY.

This anticipated change of role would potentially have a huge impact. The
will change

Introduction

In this lesson, you will be learning about **open design**, a paradigm where design operates in a transparent, self-initiated, and collaborative environment.

You will continue to practice the Double Diamond design process by creating your third course project, where you will generate a physical prototype based on some common open design principles. You will also continue reading and responding to the writing prompts for *Design and Truth* book chapters, and will have the opportunity to watch a lecture by Thomas Lomme.

Open design

The majority of the ideas presented here are drawn from an openly licensed book called *Open Design Now!*. Though out of print at the time of this writing, the entire book can be read for free at opendesignnow.org. Open design is not necessarily opposed to capitalism or the free market, though open design projects, viewpoints, and experiments often present ideas that suggest alternative ways of supporting such systems and processes in a more fair, effective, inclusive, and sustainable way. To be sure, open design tends to emphasize shifting knowledge and power structures from an elite few to the many. Distinct features of open design include a variety of attributes that are counter to how design traditionally occurs, particularly for the purpose of supporting market and business goals. Many of the projects enthusiastically discussed in *Open Design Now!* are defunct, a telling indicator of open design's relationship to the many forces and systems in play — can open design survive?

Notable projects that still exist include [Open Structures](#), [Wiki House](#), [Local Motors](#) and [Open Source Ecology](#), all of which hope to use the power of open source technology with crowdsource design communities to enable the average person to create houses, products, vehicles, and sustainable living environments.

Open design is made *available*, *sharable*, and *licensed* under open **access** terms. For access to be open, it cannot be *concealed*, *protected*, or *licensed* under a fee or payment structure. For instance, Apple, Inc. is highly secretive about their projects until they are released to the public. The Linux operating system project is a good example of a transparent-box design, where development and functionality is exposed. Open design helps others contribute by using *common digital notation language* to specify **blueprints** and plans. The use of *proprietary* notation language for specification does not contribute to openness. An example of an open specification language can be found at [Schema.org](#), where a community of developers promote structured data for the Internet. Open design is *reconfigurable* and *extendable* enabling **derivatives**, whereas design that is not open is *black-boxed* or *fixed*, preventing derivatives from being possible. Open design is *reproducible* and **not exclusive** or *limited to a finite series*. In contrast, *one-offs* are not compatible with the open design philosophies. Open design can be fabricated by commercial, off-the-shelf, multi-purpose machines expanding a **means of production** to more people. If the design must be fabricated by a skilled artisan or if it requires custom built machines or moulds, then it is not open. The **manufacturing process** of open design is subject to distributed and scalable production. A *centrally controlled* and *preset batch production* process is not open design. Open design has *generative* qualities whereas closed design does not have this potential, and is *close-ended*. [1]

DIY

Make magazine launched in 2005 by Dale Dougherty, and challenged users to move from passive participants into active product production roles. Not only would users make their own products, but they would gain in-depth understanding of how production technology works. Make: published the [The Maker's Bill of Rights](#) to their website in 2006, which includes lines like, "If it snaps shut, it shall snap open." and "Special tools are allowed only for darn good reasons."

Open source

Open source consists of projects open to modification by an engaged community of developers. This text is written and published on an open source tool called Gitbook, which itself only exists because of a multitude of other open source software projects. [This text is open source](#) as well, and modifications can be made and suggested by any one with a computer and Internet access.

Open innovation

Open innovation refers to organizations that demonstrate a large amount of transparency and discourse in their design process. One notable organization is Mozilla, chronicling their [open branding initiative](#) and requesting advice and guidance from the greater design community. Every year, IKEA hosts [Democratic Design Day](#), an event set up by the marketing department, where customers can engage in conversation with designers and glimpse into their future product lines.

Open Design Power Values

Old	New
Managerialism, institutionalism, representative governance	Informal, opt-in decision making, self-organization, networked governance
Exclusivity, competition, authority, resource consolidation	Open source collaboration, crowd wisdom, sharing
Discretion, confidentiality, separation between private and public spheres	radical transparency
Professionalization, specialization	Do-it-ourselves, maker culture
Long-term affiliation and loyalty, less overall participation	Short-term, conditional affiliation, more overall participation

[2]

Citations

1. Adapted from Open Design Now!. Page 55.
2. source: <https://hbr.org/2014/12/understanding-new-power>

Written by John Thackara and published in *Open Design Now!*

INTO THE OPEN / JOHN THACKARA

John Thackara portrays openness in general as a matter of survival to overcome the legacy of an industrial economy obsessed with control, and open design in particular as a new way to make, use and look after things. He calls upon open designers to take this responsibility seriously.

[John Thackara](#)

In 1909, Peter Kropotkin was asked whether it was possible to learn a trade as difficult as gardening from books. “Yes, it is possible,” he replied, “but a necessary condition of success, in work on the land, is communicativeness – continual friendly intercourse with your neighbours.”

Although a book can offer good general advice, Kropotkin explained, every acre of land is unique. Each plot is shaped by the soil, its topography and biodiversity, the wind and water systems of the locality, and so on. “Growing in these unique circumstances can only be learned by local residents over many seasons,” the aristocratic anarchist concluded. “The knowledge which has developed in a given locality, that is necessary for survival, is the result of collective experience.”^[1]

The biosphere, our only home, is itself a kind of garden – and we have not looked after it well. On the contrary, we have damaged many of the food and water systems that keep us alive, and wasted vast amounts of non-renewable resources. **TREND: SCARCITY OF RESOURCES** One of the main reasons we’ve damaged our own life-support system is that we under-value the kinds of socially created knowledge Kropotkin wrote about. Ongoing attempts to privatize nature, and the over-specialization of knowledge in our universities, continue to render us blind to the consequences of our own actions.

Openness, in short, is more than a commercial and cultural issue. It’s a matter of survival. Systemic challenges such as climate change, or resource depletion – these ‘problems of moral bankruptcy’ – cannot be solved using the same techniques that caused them in the first place. Open research, open governance and open design are preconditions for the continuous, collaborative, social mode of enquiry and action that are needed.

For centuries, the pursuit of knowledge **KNOWLEDGE** was undertaken in open and collaborative processes. Science, for example, developed as a result of peer review in an open and connected global community. Software, too, has flourished as a result of social creativity in what Yochai Benkler has named ‘commons-based peer production’.^[2] These approaches stand in stark contrast to the legacy left by the industrial economy – from cars to power stations – which depends on a command-and-control business model and militant copyright protection. The internet may have made it easier, technically, to share ideas and knowledge – but an immense global army of rights owners and attendant lawyers works tirelessly to protect this closed system of production.

OPENNESS, IN SHORT, IS MORE THAN A COMMERCIAL AND CULTURAL ISSUE. IT’S A MATTER OF SURVIVAL.

The open design experiments you will read about in this book – such as the 60 Fab Labs in operation as we go to press – are nodes within an alternative industrial system that is now emerging. These are the “small, open, local and connected” experiments that environmental designer Ezio Manzini views as defining features of a sustainable economy.^[3]

Open design is more than just a new way to create products. As a process, and as a culture, open design also changes relationships among the people who make, use and look after things. Unlike proprietary or branded products, open solutions tend to be easy to maintain and **TREND: GLOBALIZATION** repair locally. They are the opposite of the short-lived, use-and-discard, two-wash-two-wear model of mainstream consumer products. As you will read in the pages that follow, “nobody with a MakerBot will ever have to buy shower curtain rings again”.^[4]

Another open source manifesto states, “Don’t judge an object for what it is, but imagine what it could become.” This clarion call is welcome – but it does not promise an easy ride for open design. Our world is littered with the unintended outcomes of design actions, and open design is unlikely to be an exception. For example, 90% of the resources taken out of the ground today become waste within three months – and it’s not axiomatic that open design will improve that situation. **RECYCLING** On the contrary, it’s logically possible that a network of Fab Labs could produce the open source equivalent of a gas-guzzling SUV. The long-term value of open design will depend on the questions it is asked to address.

An important priority for open source design, therefore, is to develop decision-making processes to identify and prioritize those questions. What, in other words, should open designers design? All our design decisions, from here on, need to take into account our natural, industrial and cultural systems – and the interactions between them – as the context for our creative efforts. We need to consider the sustainability of material and energy flows in all the systems and artefacts we design. In reading the articles and case studies that follow in this book, I am confident that these caveats will be embraced by the smart and fascinating pioneers of open design who are doing such fascinating work. Crowds may be wise – but they still need designers.

1. Kropotkin, P, ‘Foreword’, in Smith, T, French Gardening, London: Joseph Fels, 1909, p. vii-viii. Available online at www.tumbledownfarm.com/drupal/French_Gardening/Forewords_by_Prince_Kropotkin, accessed on 17 January 2011. ↵
2. Benkler, Y, Coase’s Penguin, or, Linux and the Nature of the Firm. Yale Law Journal, Vol. , Vol. 112, 3, pages 369-446. ↵
3. As discussed in Manzini, E, ‘Design research for sustainable social innovation’. Available online at www.dis.polimi.it/manzini-papers/07.06.03-Design-research-for-sustainable-social-innovation.doc, accessed on 17 January 2011. ↵
4. See page 82 of this book. ↵

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<http://opendesignnow.org/index.html%3Fp=403.html>. Accessed Jan 13th, 2017

Written by Gabrielle Kennedy and published in *Open Design Now!*

ORCHESTRAL MANOEUVRES IN DESIGN / PAUL ATKINSON

Investigating the roots of open design and identifying its resulting technological, economical and societal changes, Atkinson contemplates the vast consequences this development will have for the design profession and the distribution of design.

Paul Atkinson

The concepts of open design – the collaborative creation [SHARE](#) of artefacts by a dispersed group of otherwise unrelated individuals – and of individualized production – the direct digital manufacture of goods at the point of use – at first sound like something from a utopian science fiction film. And yet, here we are. We can now easily download designs [DOWNLOADABLE DESIGN](#) from the internet, alter them at will to suit our own needs and then produce perfect products at the push of a button. Magic.

Back to the Future

In many ways though, there are huge similarities here to much older practices of production and consumption. The emergence of Do It Yourself [DIY](#) as a necessity for many is lost in the mists of time, but defined as a leisure pursuit, a pastime, it emerged from a perceived need to ‘keep idle hands busy’. In the hours following a long working day, it acted only to bring the Victorian work ethic from the factory into the home. DIY = productive leisure.

In promoting DIY as an amateur pastime, the professional practices of design (which had themselves only appeared a short while earlier) were democratized. The printing of instructional manuals in the form of popular DIY handbooks and magazines enabled anyone having developed the necessary hand skills (which were then passed down from generation to generation) to engage with creative design and production processes and make functional items for themselves.¹This process of democratization was not all plain sailing – it was one which was strongly rejected by the institutional bodies of various professions, all seeking to protect the livelihoods of their members, and was a source of tension in the relationship between amateur and professional which remains to this day.²

At first, technological developments in the design of tools and the development of new materials aided this opening up of professional practice. Some of the key turning points included the emergence of domestic versions of professional power tools, beginning with the electric drill,³[DIY](#) and the ready availability of new materials such as hardboard, plastic laminates, ready-mixed paints and adhesives. At a time when many products in the home, from furniture to kitchen fittings and from radios to standard lamps, were produced in relatively small numbers from materials such as wood and metal, these developments effectively de-skilled production processes, meaning that the individual handy man could fairly easily design and build many of the products of everyday life. However, as the professions became more and more specialized and further removed from everyday activities, technology became more complex and esoteric and the mass production of injection-moulded plastic parts became the norm, the design and manufacture of many products moved beyond the capabilities of all but the most dedicated of DIY practitioners, and the creative process moved further away from the hand of the individual. Allied to this, the lack of free time in increasingly busy private lives, and the economies of scale involved in mass production provided further disincentives. Why bother to build a bookcase yourself, when a professionally designed, perfectly well made and highly finished self-assembly version can be bought for less than the cost of the raw materials?

DO IT YOURSELF CAN BE SEEN AS: PRODUCTIVE LEISURE.

This distancing of the professional from the amateur in part contributed to the cult of the connoisseur: the idea of the professional designer as one who knew what was best for everyone, no matter who they were. The grand narrative of modernist design sought singular perfection and brought an elitist view of ‘good taste’ to the forefront of any design debate. This view held sway and did not even begin to be dismantled until the realization in the 1960s that a single design solution could not possibly fulfil the requirements of such a wide and heterogeneous market, and that the relevance of any particular design was determined by its user, not its

creator.⁴Slowly, the opinion of the user grew in importance and more enlightened design practitioners began to promote user-centred design processes, where the observed requirements of the user formed the starting point of creative product development. The logical progression of this view can be seen in the more recent emergence of co-creation design processes, where the user is finally fully involved in the creative process leading to the products they eventually consume. It is a short step from co-creation CO-CREATION or co-design to a position where users take on the responsibility for creative and productive acts in their entirety – a step which technology has now enabled everyone to make. In open design, the cult of the connoisseur has given way to the cult of the amateur:⁵those who know themselves what is best for them.

The processes of technological development that have variously brought amateur and professional closer together or driven them further apart are now acting to potentially remove the barriers between the two completely.⁶The open distribution network of the internet promotes an interactive and iterative process of creative design development amongst a globally dispersed group of potentially anonymous participants: a virtual band of individuals who can coalesce around a particular design problem, and who may or may not include design professionals. COMMUNITY After ‘solving’ a particular design problem, the band dissolves, only to reform with a different membership around a new problem. Furthermore, the people in this virtual band have at their disposal advanced manufacturing capabilities.

The appearance of Rapid Prototyping HELLO WORLD technologies in the mid-1980s, at first high-level and hugely expensive machines, allowed mass production processes requiring investment in costly tooling to be neatly sidestepped, making it possible to produce one-off products cost-effectively. Low-cost descendants of these – the designs for which are themselves disseminated and downloaded via the internet and made by hand – now enable the desktop manufacture of individualized products in the home.

DOWNLOADABLE DESIGN Technology has moved the goalposts from a position of co-creation to one where the user has the capability to completely design and manufacture products by themselves. It is a return, if you will, to a cottage industry model of production and consumption that has not been seen since the earliest days of the Industrial Revolution. What at first glance appears to be a futuristic fantasy is revealed, in fact, to be just the opposite: a recurrence of past ways of doing things.

Orchestral Manoeuvres

We have seen how this situation of open design and production occurred through the technological development of tools and materials, and a change in the standing of the individual’s opinion. Both factors increased in importance with the introduction of wide accessibility to the internet and low-cost machines for direct digital manufacture. We can safely assume that open source versions of these machines, such as the ‘CupCake’ CNC rapid prototyping machine produced by MakerBot Industries⁷, the desktop rapid protyper ‘Model 1 Fabber’ from Fab@Home⁸, or the self-replicating rapid protyper the ‘RepRap’⁹, will continue to grow in capability, becoming more and more efficient, more accurate and able to use a wider range of raw materials. Such is the nature of open development.¹⁰

IN OPEN DESIGN, THE CULT OF THE CONNOISSEUR HAS GIVEN WAY TO THE CULT OF THE AMATEUR – THOSE WHO KNOW THEMSELVES WHAT IS BEST FOR THEM.

It appears, then, that there are two physical aspects to be considered in making such technologies more acceptable to the wider public: the development of more user-friendly interfaces, or more intuitive systems for creating three-dimensional designs in the first place; and the distribution of materials in forms suitable for use in such machines. No doubt web-based supply infrastructures will appear as a matter of course as the demand for materials increases, but many current open design systems still require fairly high-level CAD modelling skills KNOWLEDGE in order to produce designs in a digital form.

Since 2002, I have been leading research projects within the Post Industrial Manufacturing Research Group, initially at the University of Huddersfield and since 2008 at Sheffield Hallam University. This work has explored the development of effective user interfaces to enable the open design of products, with the express intention of increasing amateur involvement in the design process and reducing the distance between amateur and professional. It has pushed such technologies through projects by the industrial designer Lionel T. Dean¹¹and by the artist/maker Justin Marshall.¹²

Future Factories

The web portal of FutureFactories allowed observers to watch computer models of organic forms for products such as light fittings, candlesticks and furniture randomly mutating in real time, freeze the design at any point and save the resulting file for later production by rapid prototyping. Marshall’s Automake project went a stage further, and gave the user more ability to interact with the design by

allowing them to manipulate various computer-generated mesh envelopes within which selected components would randomly be placed by the computer until a finished form appeared, which could then be printed. **PRINTING** Depending on the mesh chosen and the scale selected, the finished results could range from fruit bowls and vases down to bracelets and rings.

The exhibition I curated at the Hub National Centre for Design and Craft in May 2008 EVENTS showed the results of both these projects and allowed visitors to the exhibition to try out the Automake software for themselves. The outputs created were first printed out as colour photographs, becoming part of a growing display wall. A selection of those photographs were printed in 3D **AESTHETICS: 3D** by the industrial sponsor each week and added to the exhibition. Visitors returned again and again to see the expanding displays, with those whose work was selected and manufactured proudly bringing friends and relatives to see the results of their endeavours. These people said it was the first creative thing they had ever done, and that they could not have achieved it without the Automake system. The system enabled them to engage in a form of design and production that questioned their familiar relationship with the object.

Generative Software

Numerous systems that employ generative software and allow users to manipulate designed forms for pieces of jewellery and then have them produced by lost-wax casting or laser cutting followed soon after. One of the best known is ‘Nervous System’.¹³ Visitors to their site can either buy ready-made pieces created using their software, or run various simple interactive applets and manipulate screen designs based on organic structures such as amoebas, orchids, lichen and algae to create their own unique pieces, which can then be saved and manufactured by the supplier.

AESTHETICS: 3D The result is a growing open design library of unique but closely related forms. The code for the software is also released under a Creative Commons licence to encourage others to produce similar work.

THE GRAPHIC DESIGNER’S ROLE HAS MOVED FROM CREATING FIXED PRODUCTS TO A MORE FLUID DIGITAL PRESENCE, WHERE THEY MAY NOT BE TOTALLY IN CONTROL OF THE CONTENT CONSTANTLY BEING ADDED TO THEIR ORIGINAL CREATION.

These examples underline the value of systems that allow complex three-dimensional forms to be created by users who, for very valid reasons of lack of time and inclination, are unlikely to develop the type of Computer-Aided Design skills and 3D design awareness required on their own. The development of systems to help and support such people in the creation of their own designs should not be seen as a threat to professional designers – who might see their widespread adoption as an affront to their creative expertise and high-level training – but as an opportunity to retain key roles in the design of products. It would seem certain that the role of the designer in this situation will change rather than disappear altogether, and that this change in role will bring with it the requirement for a change in the attitude of the designer with respect to their relationship with the finished object, as well as in their relationship to the amateur user. Traditional models of authorship and ownership and the existing legal structures over rights and liabilities do not sit well with open systems of design and production, and trying to maintain them will only lead to heartbreak and disappointment. These lessons have already been learned in the allied creative industries of graphics, film and music production as they have tried to protect their income streams, and need to be heeded here.¹⁴

Graphic designers have had to learn to cope with the fact that anybody with a computer and the right software has access to the means to create and produce high-quality, finished pieces of graphic design (although the nature of the systems in place often fails to help lay users create anything that would be mistaken for ‘professional’ work). In many instances, the graphic designer’s role has moved from creating fixed, printed products to originating and possibly maintaining a much more fluid digital presence such as websites, where they may not be totally in control of the content constantly being added to their original creation.

The issues that the music industry has had to deal with include not only the enormous and unsettling changes to the processes of how their end products are distributed, but also the opening up of the existing processes of sourcing new, original material. The role of the A+R (Artist and Repertoire) person – acting as a ‘professional’ arbiter of taste and a filter between the plethora of bands aiming to get recording contracts and those that actually get them – has been replaced by the self-promotion and distribution of music by bands acting as their own producers, which is then filtered first-hand by potential listeners as part of a global online audience. Similarly, film studios have been subjected to huge amounts of ‘amateur’ **AMATEURISSIMO** material being made widely available through websites such as YouTube, which is filtered by enormous numbers of viewers rather than by a director.

The analogy alluded to here, between the role of the designer and the role of the film director, music producer, or orchestra conductor for that matter, is a good one. While the director is recognized as the creative force behind the film, it is widely understood that the process of film production is intrinsically a team effort of co-creation **CO-CREATION** involving a large cast of equally creative individuals.

Likewise, an orchestra cannot function well without a conductor, but while the conductor's role is key, the quality of the orchestral music produced relies on the active involvement of all the musicians. Perhaps what we are seeing here is the transition of the designer's role (which in reality has more often than not been one of co-creation in any case, working as they do with teams of engineers, ergonomists, marketing experts and a host of others) to a role more akin to that of a film director or orchestra conductor – with the cast or orchestra in this instance including every end user. The professional designer, I suspect, will become an agent of design, with the audience of end users selecting which designer's system they wish to employ.

THE PROFESSIONAL DESIGNER WILL BECOME AN AGENT OF DESIGN, WITH THE AUDIENCE OF END USERS
SELECTING WHICH DESIGNER'S SYSTEM THEY WISH TO EMPLOY.

This anticipated change of role would potentially have a huge impact. The relationship between the designer and the objects they initiate will change, as they might never see or even be aware of the results of their endeavours, changed as they will be by users to suit their own needs. **HACKING DESIGN** The relationship between the user and the products they own changes too, as they move from being passive consumers of designed products to active originators of their own designs. Indeed, the terms 'amateur' and 'professional' may well disappear as we move into this 'post-professional' era. Design education will also have to change its curriculum, perhaps moving closer to the learning style used in craft training – teaching students to create more meaningful, individual pieces rather than huge numbers of identically mass produced products. Designers will have to learn to develop systems that will be used by others rather than trying to remain the sole author of their own work. And while it might seem daunting for the designer to be further removed from the end product they design, it is in fact a huge opportunity for the designer to become far more closely involved with the process of production than before, with all the associated knowledge and awareness of material quality and behaviour that implies. The challenge will be to create systems that enable the design integrity of the end result to be retained and perhaps the identity of the original design intention to be perceived, while still allowing a degree of freedom for individual users to adapt designers' work to their own ends.

These orchestral manoeuvres in design will change everything for everybody, but while there may be troubles ahead, it is not all doom and gloom. The innate ability of design to adapt to change will surely be its saviour.

NOTES

1. See Atkinson, P, 'Do It Yourself: Democracy and Design', *Journal of Design History*, 19(1), 2006, p. 1-10.
2. "[P]rofessional attitudes to [amateur design] activities have continued to oscillate between fear and admiration." Beegan, G and Atkinson, P, 'Professionalism, Amateurism and the Boundaries of Design', *Journal of Design History*, 21(4), 2008, p. 312.
3. Wilhelm Emil Fein invented the first electric hand drill in 1895. (www.fein.de/corp/de/en/fein/history.html, accessed 30 September 2010) The device was developed into the 'pistol grip' format common today by Black & Decker in 1916, as they were simultaneously working on producing the Colt pistol. After noticing war-time factory workers were borrowing electric hand drills to do jobs at home, they launched a lightweight domestic version in 1946 (www.blackanddecker100years.com/Innovation/, accessed 30 September 2010).
4. Sir Paul Reilly, Head of the Design Council in the UK, wrote in 1967: "We are shifting perhaps from attachment to permanent, universal values to acceptance that a design may be valid at a given time for a given purpose to a given group of people in a given set of circumstances, but that outside these limits it may not be valid at all." Reilly, P, 'The Challenge of Pop', *Architectural Review*, October 1967, p. 256.
5. 'The Cult of the Amateur' is the title of Andrew Keen's polemic 2007 book, which urges caution in allowing the user too much authority in any creative field if the status quo is to be maintained.
6. See Atkinson, P, 'Boundaries? What Boundaries? The Crisis of Design in a Post-Professional Era', *Design Journal*, Vol. 13, No. 2, 2010, p. 137-155.
7. makerbot.com
8. fabathome.org
9. reprap.org
10. Charles Leadbeater, in his seminal book on open design *We-Think*, gives a variety of examples (including an excellent case study of the Cornish Steam Engine) where collaborative open development has created a much stronger and more successful end product than a protected, closed design. See Leadbeater, C, *We-Think: Mass Innovation, not mass production*, Profile Books, (2nd Ed. 2009), p. 56.
11. futurefactories.com
12. www.automake.co.uk
13. n-e-r-v-o-u-s.com
14. As Tadeo Toulis wrote: "Failure to appreciate DIY/Hack Culture is to risk having professional design become as irrelevant to the

contemporary landscape as record labels and network television are in the age of iTunes and YouTube.” Toulis, T, ‘Ugly: How unorthodox thinking will save design’, *Core* 77, October 2008 (www.core77.com/blog/featured_items/ugly_how_unorthodox_thinking_will_save_design_by_tad_toulis_11563.asp, accessed 30 September 2010).

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<http://opendesignnow.org/index.html%3Fp=399.html>. Accessed May 10th, 2017

Written by Andrew Katz and published in *Open Design Now!*

AUTHORS AND OWNERS / ANDREW KATZ

Andrew Katz traces the origins of the problems of copyright legislation and practice when confronted with the natural, human, social mode of creative endeavour. Building on developments in open source software, he outlines how designers could benefit from a similar model and reveals the differences between the digital and the analogue realm.

[Andrew Katz](#)

We are reaching the end of a great historical experiment. Printing (starting with Gutenberg-style presses **PRINTING** and leading to huge industrial Heidelberg printing machines), radio broadcasting, 78s, vinyl, CDs, cinema, television: all these discoveries formed the technological backdrop for this experiment. All are (or were) media based on the principle of one-to-many distribution. To understand how this experiment was initiated, and how it is reaching its end, we need to understand a little of the nature of the businesses involved in these activities, and how the law enabled them to attain, and retain, that nature. **WYS ≠ WYG**

AS THE PUBLIC GREW ACCUSTOMED TO THE IDEA OF PASSIVE CONSUMPTION, CREATIVITY BECAME INCREASINGLY MARGINALIZED.

The one-to-many broadcast distribution model distorted our perception of creativity. A key characteristic of one-to-many distribution is the role of the gatekeeper: the corporation which decides what we, the public, get to read, watch or listen to. The roles of creator and consumer are starkly defined and contrasted. As the public grew accustomed to the idea of passive consumption, creativity became increasingly marginalized, at least in those areas covered by copyright. **ACTIVISM** Creativity was perceived as capable of flourishing only through the patronage of the movie studios, the record companies or the TV stations.

The industrial technology behind printing, broadcasting and vinyl duplication is expensive. Copyright law grants a monopoly which enables the distributors of media to invest in the capital infrastructure required for their packaging and distribution. These are the businesses which grew fat on the monopolies so granted, and they succeeded in convincing the public that it was the corporations' role to provide, and the public's role to pay and consume.

The original social approach to creativity did not become extinct as the dominant producer/consumer mode became established, even for media (like music, for example) where it applied. Andrew Douglas's film *Searching for the Wrong-Eyed Jesus* shows that a visitor to the late 20th century Appalachians of the American South may well be asked: "What instrument do you play?" If the visitor answers: "I don't play any", the questioner will go on to say: "Ok, so you must sing."

Steven Johnson in *Where Good Ideas Come From* makes the convincing case, based on a mass of evidence, that the social mode is more effective at maximizing creativity than relying on lone inventors and creators sitting in their garrets and sheds. Lone creators make good central figures in a compelling narrative – one reason why this meme is so popular. However, examining the truth behind the narrative often reveals that any creative work has much broader parentage than the story suggests. James Boyle in *The Public Domain* reveals the story behind the Ray Charles song *I Got a Woman*, tracing it backwards to Gospel roots, and forwards to the YouTube mashup George Bush *Doesn't Care About Black People*, which sprang to prominence in the aftermath of Hurricane Katrina. To be sure, companies sometimes tried to foster a social model _within_ the organization, but as Johnson points out, the benefits of social creation increase very dramatically with the size of the pool of participants, due to network effects. Until company silos are able to combine, the beneficial effects are relatively small.

Technology is Expensive

The internet has proved hugely disruptive. **TREND: NETWORK SOCIETY** The sharing and social nature of Web 2.0 has enabled the rediscovery of the natural, human, social mode of creative endeavour. The social side of the internet is dominated by individuals acting in their private capacity, outside the scope of businesses. Companies were initially wary of losing control over the activities of their staff, and regarded internet social activities as time-wasting at best. In the worst-case scenario, businesses saw online social networking as a potential channel for employees to leak the company's valuable intellectual property, and were therefore often slow to see the benefits of social interaction in terms of benefits to their creativity. As they have seen the benefits accrue to their competitors, however, companies are starting to embrace a more open mode of business.

A return to the social mode is not without its setbacks. The internet radically lowered the barrier to entry for collaborative participation, and consequently increased the number of potential contacts that an entrant can make. **SHARING** This immensely powerful engine of creativity comes with a brake that inhibits its full capacity: the effect of unfit-for-purpose copyright laws.

The copyright laws of the broadcast era do more to assist the incumbent gatekeepers (the film companies, music companies and so on) than to promote the social mode of **CO-CREATION** collaboration. A side effect of the digital world is that almost every form of digital interaction involves copying of some sort. Whereas copyright law had nothing to say about sharing a book with a friend by lending it to her, in the digital realm, lending her a digital copy of *Nineteen Eighty-Four* to read on her e-book reader or computer involves a form of copying which may potentially violate copyright law.

The broadcast-model gatekeepers have used this unintended side effect of copyright law to their advantage, taking action against private individuals who had no intention of monetary gain, including mash-up artists, **REMIX** home video enthusiasts and slash fiction authors. Incumbent rights holders, fearful of losing their profitable monopoly-based businesses, have sought to extend their rights ever further by lobbying governments (frequently successfully) to legislate for new and increased intellectual property rights, extending such rights far beyond their original purpose and intention. To put the issue in context, it is necessary to ask a fundamental question: what is copyright for?

Thomas Jefferson was one of the most lucid writers on the topic. He understood well the unique nature of knowledge:

"If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of every one, and the receiver cannot dispossess himself of it. Its peculiar character, too, is that no one possesses the less, because every other possesses the whole of it. He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me. That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature, when she made them, like fire, expansible over all space, without lessening their density in any point, and like the air in which we breathe, move, and have our physical being, incapable of confinement or exclusive appropriation. Inventions then cannot, in nature, be a subject of property."^[1]

AMonopoly is a Bad Thing

Jefferson did admit that creative people should be given a limited right of exclusive control over their creations. A monopoly is inherently a bad thing, a fact that was recognized in the late 18th century, as it is today. Nonetheless, a monopoly of control in the form of copyright or a patent was the most convenient way of enabling the creators to be remunerated for their work. And once the monopoly expired, the idea would be freely available to all and would become part of the common heritage of mankind, to be used without restriction by anyone. The necessary (but limited) monopoly includes 'copyright'. The principle that the restrictions should be the minimum possible to achieve that aim should be copyright's golden rule. That golden rule has been repeatedly ignored. The scope of protection has increased steadily over the last three hundred years, to the extent that the protection granted in Europe to the author of a novel, for example, lasts for seventy years after his or her death. Materials that are not restricted by intellectual property are considered to be 'in the public domain'. Commentators have become increasingly strident in arguing that the public domain is a public good; it is likely that Jefferson would have agreed. In the same way that common land is an area where anyone can allow their animals to graze, the public domain has been described as a commons of knowledge, where potentially anyone can graze on the intellectual creations of others. The public domain has one crucial difference from a commons in the tangible world: a meadow open to all can easily be overgrazed and ruined, so that it becomes of use to no one (sometimes referred to as the 'tragedy of the commons'). It is impossible to exhaust the commons of knowledge and ideas.

The Tragedy of the Commons

The modern ‘tragedy of the commons’ is that, just as the internet makes it easier to pass ideas and knowledge [KNOWLEDGE](#) from one person to another (for “the moral and mutual instruction of man, and improvement of his condition”), it seems that legislation and the more extreme activities of the rights holders are making it more difficult for those ideas and knowledge to enter the commons in the first place. This is because the duration of intellectual property is constantly being extended (will the early Mickey Mouse films ever enter the public domain?), and so is its scope, as evidenced by the patenting of genes or plants. Increasingly, people are becoming aware of the value of the commons and are seeking to protect it. At the same time, we are gradually realizing that the monopoly granted by intellectual property laws is a blunt instrument, and that people are prepared to create for reasons other than the expectation of payment for the use of their creation. Copyright law does not always have to work against the commons. Free and open source software has been an undeniable success. Gartner confidently states that all businesses today use at least some free software in their systems; the Linux Foundation is predicting that free software will underpin a \$50 billion economy in 2011. Following from these and other successes, the applicability of the open source model has been considered in other contexts.

The Creative Commons Licenses

One of the most prominent open source models has been the Creative Commons [CREATIVE COMMONS](#) movement. Founded in 2001, Creative Commons has written a suite of licences which were inspired by the GNU/GPL, but which are intended for use in relation to a broad range of media, including music, literature, images and movies. The licences are drafted to be simple to understand and are modular, in that the rights owner can choose from a selection of options. The [_attribution_option](#) requires that anyone making use of the work makes fair attribution to the author; the [_share alike_option](#) is akin to the GPL, in that if a licensee takes the work and redistributes it (whether amended or not), then the redistribution needs to be on the same form of licence; the [_no derivatives_option](#) means that work may be passed on freely, but not modified, and the [_non-commercial_option](#) means that the work can only be used and distributed in a non-commercial context.

There are now millions of different works available under a Creative Commons licence: Flickr is just one content hosting site which has enabled Creative Commons licensing as a search option. There are, at the time of writing, nearly 200,000,000 Creative Commons-licensed images available for use on Flickr alone. Similar sites provide music and literary works under a Creative Commons licence. Creative Commons provide a legal infrastructure for designers and other creatives operating within the digital domain to adopt this model. They also offer an effective choice as to whether an appropriate model is GPL-style share-alike, or BSD style. Where designers' [DESIGNERS](#) work moves into the physical world, matters become much less straightforward. The movement of hardware design into the commons has been difficult. The fundamental issues can be summarized as follows:

- In the digital world, the creator has the choice of whether a GPL or BSD model is appropriate. This choice does not translate well to the analogue world.
- Digital works are relatively easy to create and test.on low-cost equipment. Analogue works are more difficult to create, test and copy, which creates barrier-to-entry problems.
- Digital goods are easy to transport; analogue goods are not. This creates a barrier to the communication necessary to get the maximum benefit out of network effects.

The barrier to entry for any participant in a digital project is remarkably low. A low-cost computer and basic internet access are all that is required to have a system capable of running the (free) GNU/Linux operating system, accessing (free) project hosting sites like [sourceforge.com](#) or [koders.com](#). A vast range of tools required to develop software (such as GCC – the GNU Compiler Collection) are also available as free software. Copying purely digital works is trivially easy. Physical (or ‘analogue’) objects are a different matter.

Hardware development is likely to require more intensive investment in equipment (including premises in which the hardware can be placed), not just for development, but for testing. Electronic digital hardware is probably closest to software in terms of low barrier to entry: for example, the open-source Arduino microcontroller project enables an experimenter to get started with as little as \$30 for a basic USB controller board (or less, if the experimenter is prepared to build the board). Arduino's schematics, board layouts and prototyping software are all open source. [BLUEPRINTS](#) However, Arduino-like projects represent the lowest barrier to entry in the hardware world.

Complications of Analogue

An Arduino-style project is essentially a hybrid of the analogue and the digital domains. Prototyping software makes it possible to develop Arduino-based hardware in the digital domain, where it retains all the characteristics of the digital world: ease of copying, the ability to upload prototypes to fellow contributors for commentary, assistance and the chance to show off. These are characteristics which enable network effects, and which make the open source model very powerful. It is only when the project is implemented as a physical circuit board that these characteristics are lost.

The analogue world is not always so simple. One of the most ambitious open source projects is the 40 Fires/Riversimple hydrogen car project, which has developed a small urban car (the Hyrban) powered by hydrogen, using a fuel cell/electric drivetrain. Elements of the design (such as power control software or the dashboard user interface) can be developed largely in the digital domain, but the development of motors, brakes, the body shell and so on are strictly analogue only. [WYS ≠ WYG](#) Not only do these analogue elements present a large barrier to entry for interested tinkerers, but they also tend to restrict their ability to participate in the development community: a necessity if network effects are to work. It is, clearly, difficult to upload a car to a development site and say “can you tell me why the windscreen leaks?”

COPYRIGHT PROTECTS THE EXPRESSION OF AN IDEA. RETAINING THE SAME IDEA, BUT RECASTING THE EXPRESSION OF IT IN A DIFFERENT FORM, DOES NOT INFRINGE ON THE COPYRIGHT.

Another significant issue is the lack of access to design software at a low cost. Software developers have access to high-quality tools like development environments and tools available for free under free software licences. There is no similar suite of CAD software, and proprietary CAD software is notoriously expensive. The barrier to entry is raised once again.

Many of these issues are surmountable, given time. Ever-improving simulation software means that more and more testing and prototyping can be undertaken in the digital domain. The introduction of 3D printers [PRINTING](#) like the RepRap means that it is becoming increasingly affordable and feasible to print physical objects, such as gears, from a variety of plastics. The lack of suitable CAD software is being addressed by a number of projects.

For designers, progress in open source tools, increased connectivity and so on makes the establishment of open source communities ever more feasible. The legal issues, however, are less straightforward.

So far, we have concentrated on copyright issues. In some ways, other forms of intellectual property pose greater challenges. Copyright protects the expression of an idea. Retaining the same idea, but recasting the expression of it in a different form, does not infringe on the copyright. The story of two people from warring tribes meeting, falling in love, and dying in tragic circumstances can be told in a myriad of different ways, each with their own independent copyright, none of which infringes on anyone else's copyright. This has two practical consequences. The first is that if a creator creates something which he or she has not copied from something else, then the creator will not be in breach of copyright, even if their creation turns out to be very similar, or even identical, to someone else's. The second is that if a component of something is found to be infringing on a copyright, it is possible to salvage the project by recasting the same idea in a different expression. [REMIX](#)

Design Rights

Copyright also has the advantage of being (reasonably well) harmonized worldwide, and has also proved amenable to hacking (e.g. by Richard Stallman) [HACKING](#) so that it can be used to guarantee openness in the code it covers. However, other forms of intellectual property protection are more problematic for designers.

This issue is linked to the distinction between the analogue and digital domains. Designs almost invariably start with some sort of drawing or description, which is protected by copyright as a literary or artistic work. Often, this material will be digital in nature. At this point, it is similar to software. Licensing options include the suite of Creative Commons licences. Once an item is created in the physical world, a different set of legal considerations applies.

The most obvious is design right. Unfortunately, design right is complex and uncoordinated. There are many different types of design rights, and they differ from country to country. In the UK, for example, there are four separate design right regimes operating simultaneously. Depending on the right in question, they cover aspects such as shape, texture, colour, materials used, contours and ornamentation. Registered designs are in many ways similar to patents; in fact, they are sometimes called petty patents or design patents. Infringement can be unintentional, and independent creation is irrelevant. Unregistered designs are more in the nature of copyrights, and are vulnerable to infringement only where copying has taken place. The very fact that registration of design rights is

required in itself provides a barrier to entry for collaborative projects, whereas copyright arises automatically and without the necessity of registration. On a collaborative project, who will pay for the preparation of a design registration, and who will make the application and maintain it?

Patents

Patents provide a particular problem for both programmers and designers, as they can impinge on both the digital realm and the analogue realm. Patents are a protection on the idea itself. Regardless of how that idea is expressed, its expression would represent patent infringement. Independent invention does not excuse patent infringement. The only way to be sure that an invention does not infringe a patent is to do an exhaustive check in patent offices worldwide. Such checks are very rarely carried out, since the expense is enormous and creates a vast barrier to entry for small businesses. US law in particular applies a positive disincentive to search: if a search is undertaken, then the searcher can be deemed to have knowingly infringed a patent – even if their reasonable determination was that the patent was not infringed – and will be liable to triple damages as a consequence. Pressure groups are lobbying worldwide for a reform of the patent system and process, but at present it is clear that the system benefits incumbent large companies with an existing patent portfolio.

The upshot of the intellectual property issues is that the BSD model is the only viable option in the hardware, analogue world. In contrast, those operating wholly in the digital domain (which includes programmers, but which can also extend to digital creatives such as filmmakers, novelists or graphic designers) have the ability to choose whether they prefer the GPL model to the BSD model, for a number of reasons. In brief, the two main reasons are as follows:

Copyright, being largely universal, automatic, unregistered and long-lasting, is better suited to the development of a copyleft model than other forms of intellectual property. The difference in cost between copying and reverse engineering [WYS ≠ WYG](#) (which is vast in digital world, but much smaller in the analogue world), makes the copyleft a less compelling problem. A more detailed discussion of these reasons is needed to clarify why they are pertinent.

THE SYSTEM BENEFITS INCUMBENT LARGE COMPANIES WITH AN EXISTING PATENT PORTFOLIO.

If a GPL model were applied to hardware designs, in order to be effective, it would need to impinge on the ideas underlying the design (patents), or on the visual characteristics of the design (design rights). A GPL-style model based on patents would likely fail because of the cost, complexity, and time involved in applying for the patents – not to mention the necessity of keeping the invention secret prior to its publication, since part of the application process squares badly with the open source ethos. If the model were based on design rights, it would fail in relation to registered design rights, for the same reasons as for patents. If it were based on unregistered design rights, it would be unlikely to work because the scope and length of protection would be too short, and because the rights are insufficiently universal (although there is some scope for a limited GPL-style model in relation to unregistered design rights). Even if a GPL model were feasible in the world of hardware, there is an economic reason why it would be unlikely to work. The reasoning is as follows: the digital world makes things extremely easy to copy. Imagine a programmer wants to create some software based on a program with similar functionality to a word processor released under the GPL. The options are either to take the original GPL program, modify it, and release the result under the GPL; or to take the GPL program, reverse-engineer it, and rewrite a whole new program from scratch, which would be unencumbered by copyright restrictions. There is a vast difference in the amount of work involved in the two scenarios, and any programmer is likely to consider very seriously adopting the easier, cheaper and quicker option (modifying the original), where the ‘cost’ is licensing under the GPL. However, to offer a different example, even if there were a functioning mechanism for applying share-alike to a mechanical assembly, an engineer wishing to reproduce the mechanical assembly would, in effect, have to reverse-engineer it in order to set up the equipment needed to reproduce it. Copying a digital artefact is as simple as typing:

```
cp old.one new.one
```

Copying an analogue artefact is vastly more difficult. [REPRODUCTION](#)Consequently, there is little difference between slavish copying, which would invoke GPL-like restrictions, and reverse-engineering and re-manufacturing, which would not. In this case, it is much more likely that the ‘cost’ of GPL-like compliance would be greater than the benefits of having a GPL-free object. In conclusion, even if GPL-style licences were effective in the physical world, economics would tend to disfavour their use.

It can therefore be stated that designers operating in the analogue realm are likely to be restricted to an openness model more akin to BSD than to GPL. Their challenges are to make this model work, and to discourage free riders with a combination of moral pressure and a demonstration that playing by the community norms will be beneficial both to them, and to the community as a whole.

Benefiting from Connected Creativity

Designers and creators are increasingly able to benefit from the promise of the connected, social mode of creativity. The way was paved by free software pioneers, who skilfully hacked HACKING the copyright system to generate a commons which has not only generated a huge global business, but also provided the software which runs devices from mobile phones through to the most powerful supercomputers. It provides the software which gives the developing world access to education, medical information and micro-finance loans and enables them to participate in the knowledge economy on similar terms to the developed nations.

DESIGNERS AND CREATORS ARE INCREASINGLY ABLE TO BENEFIT FROM THE PROMISE OF THE CONNECTED, SOCIAL MODE OF CREATIVITY.

The challenge for designers and creators in other fields is to adapt the model of software development to their own field of work, and to counter the extensive efforts of incumbent beneficiaries of the broadcast era to use ever more draconian legislation to prop up the outmoded business models. Ultimately, the social mode will win: it takes one of humanity's defining characteristics, the fact that we are highly social and community-oriented, and uses it as the foundation of the entire structure. One-to-many works against this fundamental trait, but Nature will ultimately triumph.

GNU/GPL AND BSD LICENSES

In the late 1980s, computer programmer Richard Stallman realized that copyright law could be turned inside out to create a commons of computer software. The method he proposed was simple, but brilliant.

Software is protected by copyright. The software business model used in the 1980s involved granting customers permission (the licence) to use a specific piece of software. This licence was conditional on the customer not only paying the software publisher fee, but also adhering to a number of other restrictions (such as only using the software on one computer). Why not, Stallman reasoned, make it a condition of the licence that if you took his software and passed it on (which he was happy for people to do), then they had to pass it on, together with any changes they made, under the same licence? He called this sort of software 'free software': once a piece of software has been released under this sort of licence, it can be passed on freely to other people, with only one restriction: that if they pass it on, in turn, they must also ensure that it is passed it on in a way that guarantees and honours that freedom for other people.

In time, he reasoned, more and more software would be released under this licence, and a commons of freely available software would flourish. The most widely used version of the licence is the GNU General Public License version 2, known as the GPL. In the 19 years since it was issued, it has become the most commonly used software licence. The GPL is the licence at the core of Linux, the computer operating system which powers Google, Amazon and Facebook, and which enabled Red Hat to forecast revenue in excess of \$1Bn in financial year 2010-11.

The software commons envisioned by Stallman not only exists; by any measure, it has been an overwhelming success. Its success can be measured in countless ways: the number of participants creating software for that GPL commons, the number of open source software programs in use, or the environments in which such software can be found. More than 90 of the 100 most powerful computers in the world run on GPL software, not to mention mobile phones and in-car entertainment systems; open source software is at the core of the business offerings of such large companies as IBM and Red Hat.

The Commons Analogy

The success of free software cannot be solely attributed to the GPL. The GPL extracts a price for using the commons. To risk taking the analogy too far, a landowner who has property adjoining the GPL commons and who wants to use it also has to add his own land to the commons. (Remember, this is the magical land of ideas which cannot be ruined by over-grazing.) This will have the effect of increasing the size of the commons as more and more adjoining landowners want to make use of the commons and donate their own land in the process. However, many of them may not want to join this scheme, either because they do not want to add their own land to the commons, or because they have already pledged their land to another commons.

Is it possible to generate a commons of ideas without forcing participants to pay the price of entry; without requiring that they add their own adjoining land to the commons? Is the compulsion of the GPL necessary, or is the social and community dynamic powerful enough to allow a similar commons of ideas to spring up on its own?

The software industry has given us several outstanding examples of this. Apache, the most popular web server software in the world, used by many of the world's busiest web sites, is issued under a licence which does not ask users to pay the GPL price. Anyone can take the Apache code, and modify it and combine it with their other software, and release it without having to release any sources to anyone else. In contrast to the GPL, there is no compulsion to add your software to the Apache commons if you build on Apache software and distribute your developments, but many people choose to contribute in return even without this compulsion. FreeBSD, to take another example, is an operating system bearing some similarity to GNU/Linux which is licensed under a very liberal licence allowing its use, amendment and distribution without contributing back; nonetheless, many people choose to do so.

Free Riders

A parallel development to the GPL was the BSD licence, first used for the Berkeley Software Distribution (BSD). As opposed to the GPL, the BSD licence only requires the acknowledgement of the original authors, and poses no restrictions on how the source code may be used. As a result, BSD-licensed code can be used in proprietary software that only acknowledges the authors.

The GPL tackles an issue called the free rider problem. Because BSD does not compel people to contribute back to the commons, those who take advantage without contributing back are called free riders. The question is whether free riders really are a problem (as the GPL band would maintain), or whether they are (as the BSD band would maintain) at worst a cost-free irritant, and at best, a cadre of people who will eventually see the light and start to contribute, once they recognize the benefits. Supporters of both the GPL and BSD models of licensing have similar aims. In both cases, they seek to support a software commons which will enable the social mode of creativity to flourish.

While the BSD model could subsist in the absence of copyright, GPL relies (perhaps ironically) on copyright law to enforce its compulsion to share. It still remains an open question as to whether the better model is to use licensing to compel people to participate in the software commons, thus reducing the free rider problem (as with GPL), or whether voluntary engagement will result in a more active community (as with Apache). Designers working outside the digital domain will rarely have the chance to choose a GPL-style option.

RIGHTS AND LICENSING SCHEMES

The re-use of designs is governed mainly by copyright, design rights and patents. Traditional open licensing schemes have been based on copyright, as this is the main intellectual property right which impinges on software, the most fertile ground for openness.

Software licensing schemes include the GPL (which enforces copyleft) and BSD (which doesn't). Software licences rarely work properly when applied to other works. For literary, graphic and musical works, the Creative Commons suite is more effective. They allow both copyleft (share alike) and non-copyleft options. They may work well when applied to underlying design documents, which are covered by copyright, and control the distribution of those documents, as well as the creation of physical objects from them, but (depending on the jurisdiction) their protection is unlikely to extend to copying the physical object itself. Some efforts have been made to create licences that cover hardware; the TAPR Open Hardware Licence is one example. However, these efforts have frequently been criticized for their lack of effectiveness.

www.opensource.org/licenses/index.html

CREATIVE COMMONS AND DESIGN RIGHTS

Creative Commons licensing is fundamentally based on copyright, and there is little clarity or consensus on how such licenses would operate in relation to design rights across the myriad different jurisdictions and types of rights.

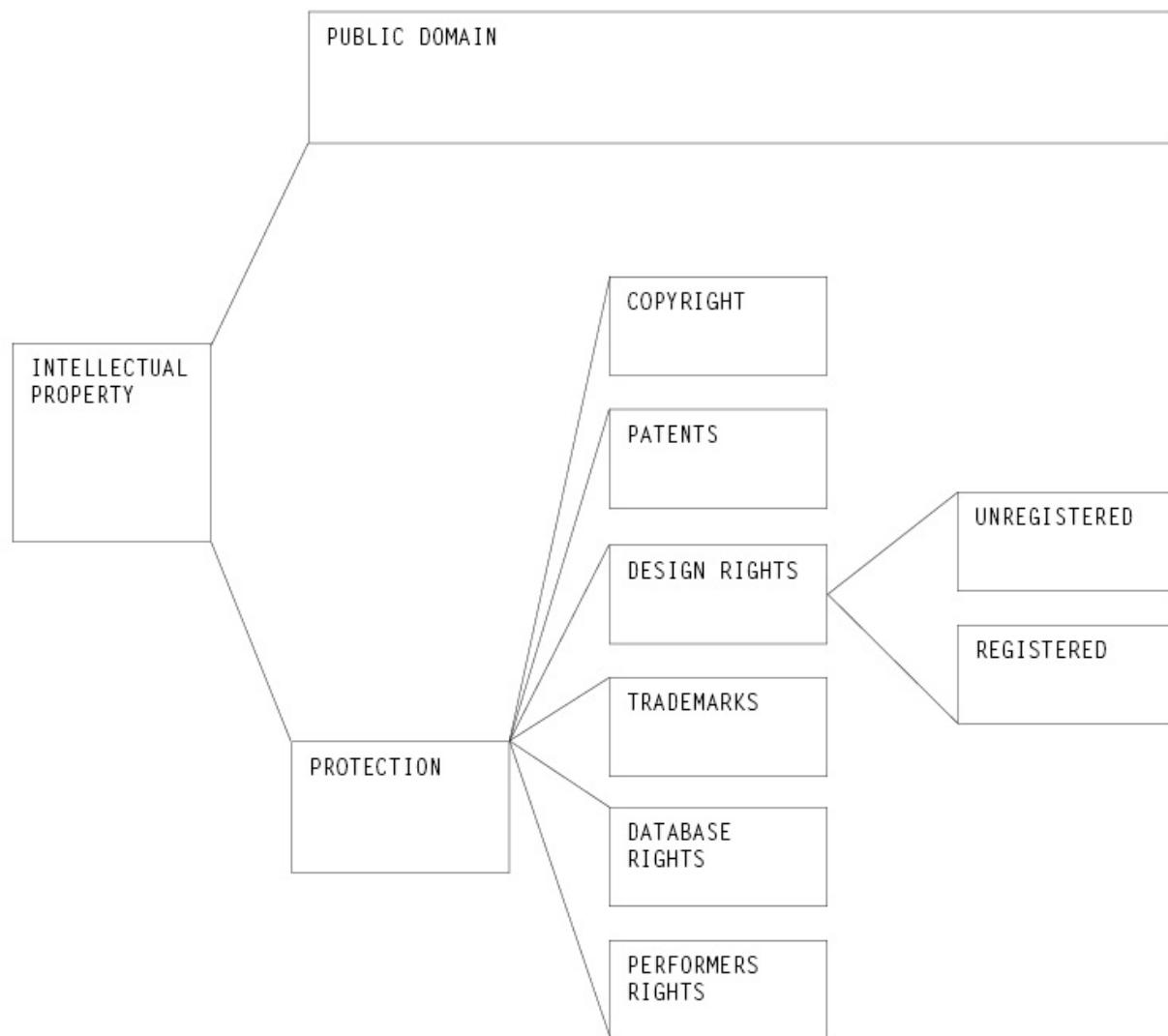
Those designers operating purely in the realm of copyright will find that there is already an existing structure of support in terms of Creative Commons licences and associated communities. Where other forms of intellectual property impinge, matters are far more murky. The Creative Commons licences are arguably drafted to be sufficiently broad as to cover unregistered design in certain

circumstances. However, since they were not drafted with design rights in mind, it cannot be assumed that the copying of a three-dimensional object will automatically fall within the scope of such a license.

www.creativecommons.org

STRUCTURE OF INTELLECTUAL PROPERTY

The rule of thumb for intellectual property is that all works are considered to be in the public domain, with intellectual property protection as the exception. However, this exception is highly diversified. Copyright protects the creative, original expression of an idea, whereas patents protect the idea itself and its technical specifications. Design rights cover aspects such as shape, texture, colour, materials, contours and ornamentation. Other forms of protection include trademarks, database rights and performers' rights.



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<http://opendesignnow.org/index.html%3Fp=407.html>. Accessed Jan 13th, 2017

Written by Michel Avital and published in *Open Design Now!*

THE GENERATIVE BEDROCK OF OPEN DESIGN / MICHEL AVITAL

A shift in communications infrastructure is an important factor in how open design has taken shape and the possibilities it offers. It is a transition from the ‘internet of things’ to the things of the internet. Michel Avital analyses the main drivers behind open design, open innovation and open source. He describes the major features of open design and explores the preconditions for open design in relation to four aspects: object, process, practice and infrastructure, with a specific focus on infrastructure.

[Michel Avital](#)

‘Openness’ is a recurring and increasingly frequent theme in recent buzzwords that populate the discourse on the forefront of technology, from *open source_via_open innovation to open design*. A review of related articles in the popular press and trade magazines indicates that the modifier *_open_* often denotes better, cheaper and faster. Apparently, the qualities inherent in openness or being open have materialized as the underlying enablers that pave the way for creativity, innovation and prosperity. In keeping with the thrust of this volume, this article contextualizes open design, focusing in particular on the characteristics of the infrastructure that are most conducive to its generative capability in relationship to innovation.

The Context of Open Design

Openness pertains to accessibility. Openness is a relative characteristic that refers to the degree to which something is accessible to view, modify and use. The ability to *view* refers to sharing **SHARING** content and the availability of detailed information about the subject matter. The ability to *modify* refers to sharing labour and empowering changes, improvements and extensions of subject matter. The ability to *use* refers to sharing ownership and enabling semi or unrestricted reuse of the subject matter or parts thereof. These are the three fundamental operations that are implied by accessibility. Subsequently, from a systems theory perspective, openness relates to the transparency and permeability of any natural or constructed boundaries. Yet openness is not merely a technical attribute that conveys flow or lack thereof; it is an embedded trait that pervades the structure of a thriving civil society. From a social perspective, openness is a core characteristic of an infrastructure that conveys and reinforces sharing, reciprocity, collaboration, tolerance, equity, justice and freedom. The application of openness, **OPEN EVERYTHING** as implied by various accessibility features, to a growing number of central ubiquitous practices that drive the human enterprise, has turned into a megatrend that can be labelled the *Rise of Open-X*. Megatrends are widespread trends which have a major impact and are likely to affect all levels – individuals, organizations, markets, countries and civil society – for a long duration. Understanding megatrends **TRENDS** and their rolling effects can provide valuable information for developing futuristic scenarios and can subsequently help to shape current actions in anticipation of that future. So far, as described below, Open-X has materialized in various configurations that can be classified according to three archetypes: open innovation, open source and open design. The three archetypes are juxtaposed in the table on the previous page as a preliminary overview to point out

their different respective value propositions and thrust (as a distributed collective action), core openness orientation, and prime actors involved.

JUXTAPOSING ARCHETYPES OF OPEN-X

OPEN INNOVATION

OPEN SOURCE

OPEN DESIGN

VALUE
PROPOSITION
AND THRUST

DISTRIBUTED
KNOWLEDGE

DISTRIBUTED
DEVELOPMENT

DISTRIBUTED
MANUFACTURING

CORE
OPENNESS
FACET

VIEW

MODIFY

USE

PRIME
ACTORS

ORGANIZATIONS

DEVELOPER
COMMUNITIES

CONSUMERS

Open Innovation

The value proposition and thrust of open innovation is ‘distributed knowledge’ processes that emphasize the view-related capabilities of openness. The prime actors of open innovation are organizations. According to the traditional doctrine, industry leaders self-create the most and the best ideas; innovation should therefore be fostered by internal development teams behind high organizational walls and protected as a trade secret. In contrast, according to open innovation, industry leaders make the best use of internal and external ideas to develop better business models. In other words, superior outcome should be expected with permeable boundaries between a firm and its environment, which allow idea flow, knowledge

KNOWLEDGE exchange, and intellectual property trade. Reaching out and tapping into external knowledge resources extends the generative and innovative capabilities of a firm, as demonstrated by industry leaders like Procter & Gamble, Boeing, Philips and many others. The tenets of open innovation have promoted the proliferation of communities of practice and laid the foundations of crowdsourcing CROWDSOURCING

Open Source

The value proposition and thrust of open source is ‘distributed development’ processes that emphasize the modification-related capabilities of openness. The prime actors of open source are developers. The open source concept originated in the software industry; according to the traditional doctrine, software is developed in commercial software firms by professional personnel, guarded through legal and technical measures, and then licensed for a fee. In contrast, according to the open source business model, software is developed through coordinated peer production by independent volunteers.

THE APPLICATION OF OPENNESS TO A GROWING NUMBER OF PRACTICES THAT DRIVE THE HUMAN ENTERPRISE, HAS TURNED INTO A MEGATREND THAT CAN BE LABELED THE RISE OF OPEN-X.

Subsequently, everyone can freely access the source code, and can modify and redistribute it under the same terms, thus nourishing continuous cycles of improvement, adaptation, and extension in a distributed fashion. Reaching out and tapping into external development resources extends the generative and innovative capabilities of a core project. Inspired by the impact of high-profile projects like Linux and Mozilla Firefox, the tenets of the open source development, licensing and distribution model have promoted the proliferation of open source projects of all sorts – from digital content development (e.g. Wikipedia), via vehicles (e.g. c,mm,n) and beverages (e.g. Free Beer – Vores øl), to 3D printers (e.g. RepRap), just to name a few. [OPEN EVERYTHING](#)

Open Design

The value proposition and thrust of _open design _is ‘distributed manufacturing’ processes that emphasize the _use-related _capabilities of openness. The prime actors of open design are consumers. Although designers undoubtedly play a pivotal role in fostering open design by producing and sharing suitable design blueprints, [BLUEPRINTS](#) ultimately the consumers who engage in distributed manufacturing are the core players and _raison d'être _of open design. According to the traditional doctrine, design is mostly a preliminary stage prior to commercial manufacturing and distribution. In contrast, open design is directed toward consumers who engage in fabrication, passing over the conventional manufacturing and distribution channels. Open design implies that the design blueprints are publicly available, sharable, licensed under open-access terms, and distributed digitally in a general design specification file format (e.g. dxf, dwg). Moreover, open design is not black-boxed or exclusive; it implies reconfigurable and extensible design that can be fabricated in distributed and scalable fashions through commercially available, off-the-shelf, multi-purpose means of production.

A structured description of the unique features and boundaries of open design is provided in the table on the next page. The inherent reconfiguration and extension potential of a user-driven open design reinforces the generative and innovative capabilities of consumers. The tenets of open design have inspired the development of public manufacturing facilities networks like Fab Lab, and laid the foundations of open design clearinghouses like Ponoko, Shareable and Instructables. In summary, the distinctions between the three archetypes of Open-X are more a matter of thrust and areas of application. They are not mutually exclusive. All three inherit the core features of openness and naturally overlap to some degree. Open design, for example, is not merely a matter of re-use and distributed manufacturing – it also entails sharing design blueprints and sharing extensions thereof, thus distributing knowledge and development. Building on the working definition of open design and an understanding of its unique features, the remainder of this article will discuss its potential, in particular addressing the infrastructure characteristics that are most conducive to its generative capability in the context of innovation.

Unpacking Open Design

Open design signifies open-access digital blueprints that can be adapted at will to meet situated requirements, and can subsequently be used by consumers to fabricate products on demand by commercial, off-the-shelf production methods. The open design model diminishes the traditional vertical value chain that is formed by designer-manufacturer-distributor-consumer relationships and offers an alternative, open web of direct links between designers and consumers. The resulting short-spanned, transient and non-hierarchical relationships forge dynamic and flexible arrays of blueprints that are not only user-centred but also user-driven.

The discourse on open design encompasses a multitude of considerations: for example, design specification, fabrication, collaborative action, supply and value chain management, business models, legal aspects, technological infrastructure and normative values. The complexity of this ecology can be untangled to some extent by classifying the underlying issues of open design into four interdependent conceptual layers, as follows:

_Object layer _refers to the _design blueprints _that enable and constrain the specification of the design artefacts. This layer encompasses the design and distribution of open design objects, that is, configurable and extensible blueprints that are available under open access license in online public repositories.

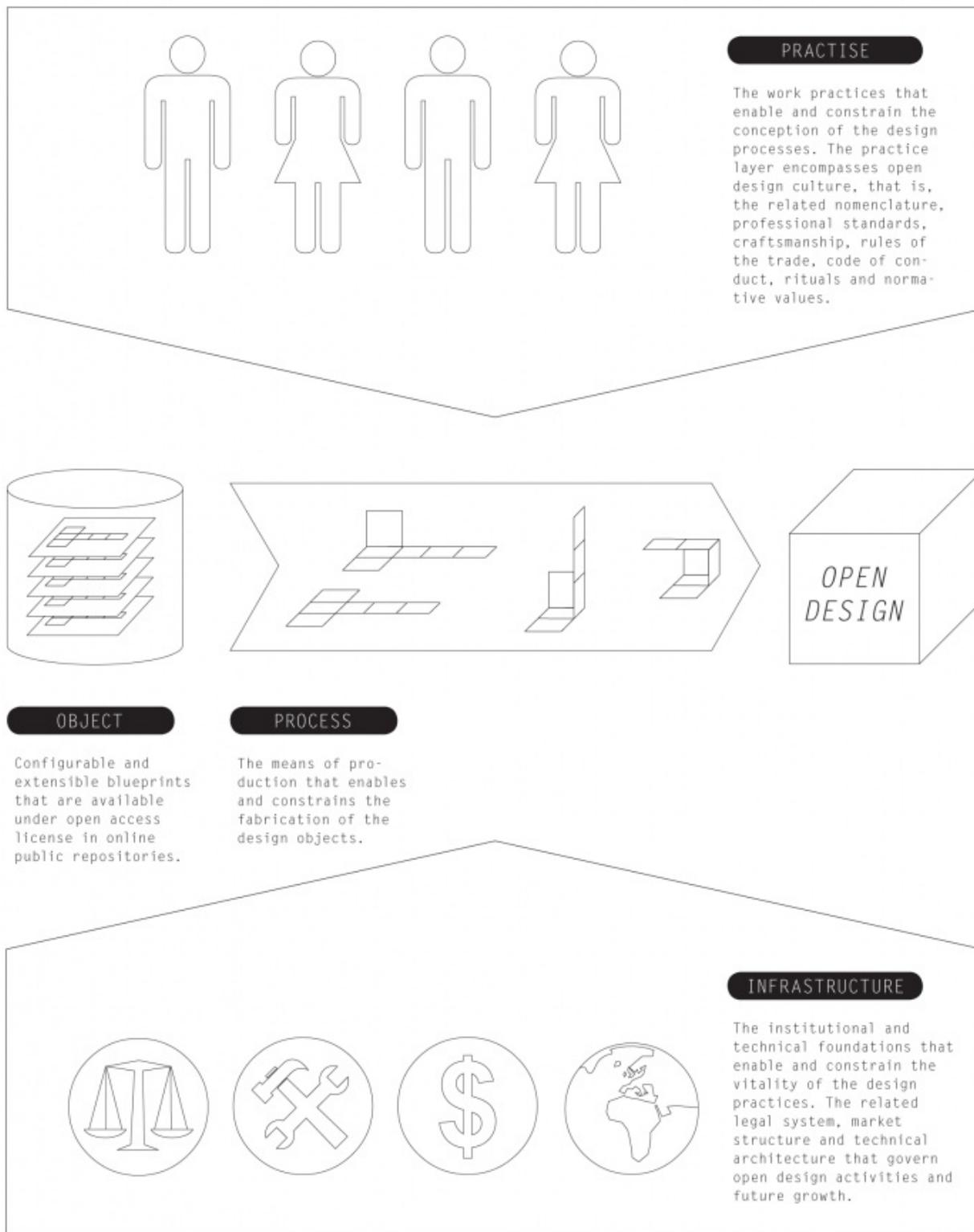
_Process layer _refers to the _means of production _that enables and constrains the fabrication of the design objects. This layer encompasses open design fabrication, that is, the application and operation of commercial, off-the-shelf machinery like printers, PRINTING laser cutters or CNC machine tools to produce customized products with no custom-built moulds or machines.

_Practice layer _refers to the _work practices _that enable and constrain the conception of the design processes. This layer encompasses open design culture, that is, the related nomenclature, professional standards, craftsmanship, rules of the trade, code of conduct, rituals and normative values.

Infrastructure layer refers to the underlying institutional and technical foundations that enable and constrain the vitality of the design practices. This layer encompasses open design substructure, that is, the related legal system, market structure and technical architecture that govern open design activities and future growth.

The discourse so far is focused on the object and process layers, with some touches upon the practice layer. However, quite surprisingly, despite its fundamental role, the infrastructure layer is virtually ignored.

LAYERS OF OPEN DESIGN



Designing Generative Infrastructure

The infrastructure that governs open design activities, business models and development is based on the related code of law, market structure and technical architecture, which together enable and constrain most human activity systems in an attempt to balance inherent conflicts and pursue the common good. In a general sense, infrastructures are designed to promote fairness, wealth and operational efficiency. **TEMPLATE CULTURE** Much has been written about the general nature of infrastructures elsewhere, leaving no need to reiterate it here. Instead, let us elaborate on the generative capability of infrastructure as an additional area of concern that should be considered particularly in the context of developing infrastructure requirements for open design. In view of the generative character of design in general, and open design in particular, developing an appropriate infrastructure should aim to incorporate the structural features that are most conducive to creative processes and products. Building on the concept of *generative design*, I suggest a set of generalizable considerations for designing such infrastructures. More specifically, I propose that the infrastructure of open design should be evocative, engaging, adaptive, and open.

Generative design refers to the design considerations in developing an array of artefacts and interactions that support and enhance *generative capacity* – that is, the considerations in designing systems that are conducive to the ability of a person or group to produce new configurations and possibilities, to reframe the way we see and understand the world, and to challenge the normative status quo.¹ People's generative capacity is a key source of innovation; by definition, generative design aims to encapsulate the design directives that enhance and complement that human capability.

In general, generative capacity refers to having an evocative power or aptitude that can result in producing or creating something, or tapping into a source of innovation. In the context of open design infrastructure, the modifier 'generative' denotes that the noun it modifies is conducive to the production of something innovative or the discovery of new and hitherto unknown design alternatives. In other words, generative design refers here to the design requirements and considerations in developing open design infrastructures – that is, the related code of law, market structure and technical architecture – that augment people's natural ability to innovate. Subsequently, four top-level design directives are suggested for infrastructures, as follows:

_Generative infrastructure is evocative

_Generative infrastructure inspires people to create something unique. It evokes new thinking and enables them to translate their ideas into a new context. The infrastructure can help to create the environment or conditions that are prone to those insights by generating and juxtaposing diverse frames that are not commonly associated with one another within an underlying context. Systemic features that drive evocative design enable, for example, seeing an object or situation from multiple perspectives, testing it in multiple situations, examining it at multiple degrees of granularity, and exploring multiple overlay configurations.

Generative infrastructure is engaging

_Generative infrastructure is enchanting and holds the attention of people by inducing their natural playfulness and 'flow experience'.

*The infrastructure **TEMPLATE CULTURE** can help in the creation of engaging environments or platforms that stimulate the users' cognitive spontaneity and playfulness as well as overall positive affect state, thus encouraging further exploration, tinkering and experimentation. Systemic features that drive engaging design enable, for example, fostering positive affect and high spirit that stimulate a state of '*joie de vivre*', activating cognitive spontaneity induced by playfulness, and stirring up curiosity through intriguing challenges.*

_Generative infrastructure is adaptive

_Generative infrastructure is flexible and conducive to effective use by a heterogeneous set of people in their own respective environments and for various tasks within an intended scope. It can be adapted with respect to the type of users or groups that it serves in diverse problem spaces. It is also simple to understand and easy for anyone to master. The infrastructure can help in the creation of adaptive systems or platforms that are flexible yet powerful enough to enable the generation of a continuous stream of new ideas and configurations. Systemic features that drive adaptive design enable, for example, user-induced tailoring and customization to meet situated needs, self-production of complementary extensions and features that meet new or initially unforeseen needs, automatic system-induced adaptation, and overall scalable functionality with no regard to size-related attributes.

_Generative infrastructure is open

*_Generative infrastructure accentuates permeable boundaries and transparency that promote co-production, cross-fertilization and exchange of any kind. The infrastructure **ARCHITECTURE** can help in the creation of open systems or platforms that provide connectivity, enable transparency, allow information sharing, and encourage dialogue with no regard to institutionally or culturally imposed boundaries. Systemic features that drive open design enable, for example, free and unrestricted access to information, communication among all stakeholders, and the easy integration of third-party extensions by independent boundary-spanners. In summary, from the generative requirement perspective, infrastructures of open design should be evocative, engaging, adaptive and open. However, while the last two directives are clearly implied in the discourse of open design, the first two have not yet been addressed. Subsequently, the inclusion of evocative and engaging features in the infrastructure of open design, let alone in the discourse concerning*

its requirements, is strongly recommended. Although this conclusion might not be obvious for legislators, policy makers, managers, and engineers, it should be quite intuitive for designers. The expected proliferation of open design has far-reaching implications that are likely to extend well beyond design practices as such and have significant socio-economic effects on a global scale.

THE DISTINCT FEATURES OF OPEN DESIGN

OPEN DESIGN IS...

OPEN DESIGN IS NOT...

ACCESS

AVAILABLE, SHARABLE,
LICENSED UNDER OPEN-
ACCESS TERMS

CONCEALED, PROTECTED,
LICENSED FOR A FEE

BLUEPRINTS

SPECIFIED BY COMMON
DIGITAL NOTATION
LANGUAGE

SPECIFIED BY
PROPRIETARY NOTATION
LANGUAGE

DERIVATIVES

RECONFIGURABLE AND
EXTENSIBLE

BLACK-BOXED AND FIXED

EXCLUSIVITY

REPRODUCIBLE

LIMITED TO A FINITE
SERIES OR ONE-OFF

MEANS OF PRODUCTION

FABRICATED BY
COMMERCIAL, OFF-THE-
SHELF, MULTI-PURPOSE
MACHINES

FABRICATED BY ARTISAN
HANDWORK, CUSTOM-
BUILT MACHINES OR
MOULDS

MANUFACTURING PROCESS

SUBJECT TO DISTRIBUTED
AND SCALABLE
PRODUCTION

SUBJECT TO CENTRALLY
CONTROLLED AND PRESET
BATCH PRODUCTION

POTENTIAL

GENERATIVE

CLOSED-ENDED

Another Brave New World

Open design presents entrepreneurs and agile companies with a grand opportunity to expand existing markets, to develop new ones, and to capture large shares from current market leaders. Mobilizing open design to generate organizational value and to boost its market position requires radical strategic and operational changes. However, the tight coupling between design and production, which has so far been instrumental in fostering economies of scope and competitive advantages for the current industry leaders, is now likely to hinder their agile capability and their ability to take advantage of the new vistas that are beginning to be afforded by open design.

PEOPLE'S GENERATIVE CAPACITY IS A KEY SOURCE OF INNOVATION; BY DEFINITION, GENERATIVE DESIGN AIMS TO ENCAPSULATE THE DESIGN DIRECTIVES THAT ENHANCE AND COMPLEMENT THAT HUMAN CAPABILITY.

The adoption of open design practices by established industry leaders, let alone run-of-the-mill manufacturers, where the dominant culture and mode of product design has been shaped and reshaped over long periods, is likely to pose multiple challenges to these organizations at all levels, from the boardroom to the production floor. Subsequently, the resistance to change in these organizations is expected to reinforce the current tight coupling between product design and industrial manufacturing. Just as Amazon could conquer the market share of established retailers that were unable to adapt quickly enough to the new marketplace of e-commerce, emerging market players based on open design business models are likely to cannibalize the turf of established manufacturers that are entrenched in the old model of industrial production.

From Push to Pull

Open design paves the way to the next [iteration](#) in the massive shift from push to pull business models. In general, push business models are based on top-down value chains where a line of a few mass-produced products is distributed broadly through value-driven downstream marketing techniques. In contrast, pull business models are based on bottom-up value chains where a line of customer-configured products are distributed individually through features-driven upstream marketing techniques. Whereas push models are based on economies of scale and emphasize cost efficiency, pull models are based on flexible manufacturing and emphasize mass customization. In previous centuries, most artefacts – from shoes to carriages – were custom-designed and built on demand by a craftsman. Building on push business models, the industrial revolution almost wiped out cottage manufacturing and shifted its lion's share to production lines and mass-scale manufacturing in factories that offer economies of scope and scale. Consequently, the resulting abundant supply of affordable products was instrumental to massive market expansion, higher living standards, and growing wealth across the board. This prosperity has come at the expense of product variety and personalization, as most notoriously conveyed by Ford's remark "any color as long as it's black". [MASS CUSTOMIZATION](#)

OPEN DESIGN INFUSES 'DO IT YOURSELF' WITH A WHOLE NEW MEANING THAT GOES FAR BEYOND COST SAVINGS OR THE JOY OF CRAFTING.

The advent of the internet has bestowed a new communication infrastructure that made it possible not only to exceed the economic accomplishments of industrialization, but also to offer an unprecedented variety of products and personalization thereof. The latter has been accomplished through pull business models and upstream marketing that take advantage of automated fulfilment and logistics centres supported by fast, wideband, many-to-many communication networks. The extent of product variety and personalization has been attained and fortified in three main phases enabled by the accessibility (i.e. ability to view, modify and change) afforded by the internet. In the first phase, [retailers](#) have introduced consumers to the ability to view up-to-date, rich and targeted information about off-the-shelf products, thus enabling them to make informed decisions. Then, in the second phase, [manufacturers](#) have introduced consumers to the ability to [modify](#) base products and specify a customized configuration thereof, thus enabling them to fine-tune a product according to their preferences. Finally, in the still-nascent third phase, [designers](#) have introduced to consumers the ability to [use](#) [blueprints](#) for self-managed fabrication, thus enabling them to gain full control over the features of the resulted product as well as its production process. In summary, as in a stage model, every phase builds upon the previous one to bring the consumers closer to the designers and to provide them with more control over what they get, how it is produced, and how it is delivered.

The Road Ahead

Open design is still nascent, yet it provides a springboard for radical changes in the way we acquire almost anything that is currently mass-produced. Open design presents a new way of design that complements new methods of fabrication, commonly branded as 3D printers [PRINTING](#) of all sorts. Open design infuses 'Do It Yourself' with a whole new meaning that goes far beyond cost savings or the joy of crafting. It allows consumers to be in charge and offers them an opportunity for full customization of an artefact, including a choice of features, materials and delivery options. It allows for continuous innovation and localization, which in turn has major

implications for consumers in shoestring economies as well as in developed countries. It also provides a fertile ground for the development of new forms of organization, new business models, new supply chain structures, new varieties of products and services, and the like, as demonstrated in the many cases in this volume. Nonetheless, traditional design and mass manufacturing practices have been extremely valuable since the Industrial Revolution [REVOLUTION](#) and are unlikely to disappear in the future. Although the threat to the dominant technologies and practices may seem implausible, open design presents a clear alternative that may grow strong once it reaches a critical mass in the right socio-economic conditions. Open design is not a threat to designers' livelihood. Quite the contrary; it opens new vistas and new opportunities and is likely to generate increased consumer appreciation of the role of designers. Moreover, it is likely to bring designers closer to the intended and unintended applications of their designs. Grand opportunities also imply undeveloped land. There is much development to do in all four layers of open design – the object, process, practice and infrastructure layers. To a large extent, the discourse mirrors the field; the most immediate attention is required in shaping practices and laying the foundations of the support infrastructures.

Conclusion

It has been suggested that open design stands for accessible design in the form of blueprints that are publicly open to view, modify and use under open-access terms. Moreover, open design often implies that the design blueprints are available via open-access digital repositories, that they can be adapted at will to meet situational requirements, and that they can be used by consumers to fabricate products on demand by commercial, off-the-shelf means of production. [DOWNLOADABLE DESIGN](#) Open design is generative. It is conducive to continuous re-design, adaption, refinement and extension. Open design is a potent elixir that mitigates stagnation and awakens generative action.

1. See Avital, M. and Te'eni, D., 'From Generative Fit to Generative Capacity: Exploring an Emerging Dimension of Information Systems Design and Task Performance', *Information Systems Journal*, 19(4), 2009, p. 345-367. ↪

DESIGN LITERACY: ORGANIZING SELF-ORGANIZATION / DICK RIJKEN

The position of knowledge and expertise is changing radically, particularly in relation to how design literacy is affected when confronted with digital tools and media. Dick Rijken analyses design literacy on three levels – strategic, tactical, and operational – and examines the requirements of open design for developing a design vision, design choices and design skills.

Dick Rijken

Life in this network society [TREND: NETWORK SOCIETY](#) is complex. We are involved in many different kinds of fluid relationships with friends, family, acquaintances, co-workers, project partners, companies, brands, websites, platforms, clubs, schools, and many other kinds of communities. More often than not, we maintain these relationships using digital media like Facebook, YouTube, Flickr, and plain old email. We connect, communicate and share like our lives depend on it – as, increasingly, they in fact do. [SHARING](#)

In his article, Paul Atkinson talks about the demise of the *grand narrative of modernist design*. While this is very true, it is not solely applicable to design; it applies similarly to all grand narratives, and to modernism in general. Where we were once infatuated by concepts like universal truth and linear progress, we now find ourselves in a chaotic maze of anecdotes and interconnected ideas. Linear progress has become perpetual change with no shared direction. Within that change, we are on a perpetual quest for personal meaning, no longer seeking truth. All this is not necessarily a bad thing, but it does make life difficult and unpredictable. If we can learn to improvise and to adapt, life can be deeply meaningful and rewarding. We are not there yet, though; there is still a lot to learn.

WE CONNECT, COMMUNICATE AND SHARE LIKE OUR LIVES DEPEND ON IT. AS, INCREASINGLY, THEY IN FACT DO.

This article deals with the changing position of knowledge [KNOWLEDGE](#) and expertise in open networks. Digital tools and media are generic infrastructures for creating, sharing and transforming information. They enable and facilitate personal learning on a massive scale. Anything that can be converted into a digital format can also be stored, shared and used by any one, anywhere. This changes everything that has anything to do with ideas – and therefore also changes design. It changes how we design, it changes what we design, it changes how we think about design, and it changes how we learn and teach design. Ultimately, it will also change who designs. Web 2.0, with the concept of user-generated content at its core, will not leave the design discipline untouched.

Fundamental Paradoxes

In order to understand what is happening to design, we need to understand two strongly related paradoxes that are fundamental features of networks: the paradox of identity, and the paradox of choice.

The paradox of identity arises from the fact that networks are made of nodes and links, i.e. identities and relationships. Nodes have their own unique identity, but that identity is meaningless without links to other nodes. We have become more independent from others through the development and actualization of our own unique individual self. But at the same time, we have become more dependent on others, since who we are depends to a large extent on who we relate to and interact with. We feel a need to stand out in a crowd, but we are nothing if not connected. [TREND: NETWORK SOCIETY](#)

We depend on fluid networks around us for our daily lives' activities. Parties are announced on and communicated through Facebook, and the fun is later shared [SHARING](#) through pictures on Flickr. We find jobs using LinkedIn, where we present our professional résumés, and ask people we've worked with in the past to write positive testimonials about us. We don't exist if we have no visible presence in the networks we want to be involved in. If you are what you act like, you better make sure you act like who you are – or who you want to be.

This makes the network society an essentially cultural place. This is true not just in the anthropological sense that everything we learn is seen as ‘culture’, but in a very instrumental sense as well: activities like ‘expression’ and ‘reflection’ that are at the core of art and related cultural activities give form to the networked life of an individual. And this brings us to the second paradox, the paradox of choice. We are the designers of our own lives through the choices we make, and there are more choices open to us now than ever before. At the same time, this freedom has a dark side to it: **we_must_choose**, whether we like it or not. **MASS CUSTOMIZATION** The freedom of choice that we have is also an inescapable obligation. With choice comes responsibility. The ability to reflect and give form to our lives within given constraints is just as important for an individual as reading, writing or arithmetic. In this context, we move from ‘design as culture’ to a culture of design, where design is part of our natural mode of being.

Atoms and Bits

There is help at our disposal. Digital tools, digital media and the vast resources on the internet collectively create a massive open and accessible infrastructure for individual and communal expression and reflection. In some domains, we have seen an explosive amount of activity (music production, digital photography) that has turned whole industries upside down. **OPEN EVERYTHING** Other domains are just getting warmed up. This is particularly true for three-dimensional objects. As different technologies for 3D printing are becoming affordable, Fab Labs (‘fabrication laboratories’, a concept developed at MIT’s Center for Bits and Atoms) have spread from inner-city Boston to rural India, from South Africa to the far north of Norway. Activities in Fab Labs range widely, including technological empowerment; peer-to-peer, project-based technical training; local problem-solving; small-scale, high-tech business incubation; and grassroots research.

THERE IS A PRODUCTION INFRASTRUCTURE IN THE MAKING THAT WORKS WITH STANDARDIZED FORMATS FOR SPECIFYING 3D DESIGNS, SO THAT OUR IDEAS FOR OBJECTS CAN BE PUBLISHED, SHARED AND MODIFIED JUST AS EASILY AS VIDEO CLIPS ON YOUTUBE.

There is a production infrastructure in the making that works with standardized **STANDARDS** formats for specifying 3D designs, so that our ideas for objects can be published, shared and modified just as easily as video clips on YouTube. Do-It-Yourself is no longer a matter of wood and nails; **DIY DIY** is becoming more refined in terms of possible forms and construction concepts. In other fields, technological impulses like this have created an explosion of creativity among experts and amateurs alike. Accompanying that surge of creative expression, there is an awareness of the fact that technological facilitation is only meaningful at a very basic level. Anything that is fundamentally expressive or reflective derives its value from ideas and values that are embodied – and ideas and values come from people, not from technology. Again: anything is possible, but what do we want? Before we can rearrange atoms, we have to rearrange bits. Ideas! A richer palette of possible material forms requires a richer imagination than ever before. Buying a guitar does not make me a musician. Access to 3D design tools does not make me a designer.

Why Keep It Simple?

The concept of self-organization is an intriguing idea. Online media environments like YouTube, Flickr and Blogspot prove that well-designed (!) infrastructures

ARCHITECTURE can indeed facilitate personal expression on a mind-boggling scale, but they have one thing in common: simplicity. The media formats are simple (‘upload a picture here’, ‘this is a heading, type your text here’), and the media produced and shared by these tools are simple (a picture, a movie clip, a piece of text). But real life is not always that simple. As I’ve argued above, in networks, life can be annoyingly complex and most of us are not born with sufficient imaginative capacity to fully utilize the potential of the production technologies that are currently available. Most of us need help. When it comes to more complex media or artefacts, rolling out infrastructures and expecting self-organization to take care of the rest is simply not enough. Organizing self-organization is a lot of work, and does in fact involve a great deal of design and inspiration.

WE ARE DESIGNERS OF OUR OWN LIVES THROUGH THE CHOICES WE MAKE. THIS FREEDOM HAS A DARK SIDE TO IT: WE MUST CHOOSE, WHETHER WE LIKE IT OR NOT.

Traditional DIY stores know this very well. They don’t just sell basic construction materials anymore, but increasingly also offer ready-made lifestyle products: lamps, furniture, various semi-manufactured products, and so on. What’s more, they know that they need to help amateurs when it comes to making choices. Most websites for DIY stores **DIY** feature some form of assistance. Besides tips and suggestions from famous designers, there are online tools that help buyers figure out their personal preferences for interior design. I’ve even seen moodboard tools for interior decoration. For people who feel completely adrift in the sea of choices, there are style coaches to help buyers find out who they are and what choices to make.

Design Literacy

When it comes to more innovative or complex designs, inspiration and imagination are just as crucial as production technologies. This holds true for seasoned pros and enthusiastic amateurs. When motivated prosumers want to express their identities, they need different kinds of knowledge and skills, which together make up what we can call ‘design literacy’. I suggest we conceptualize this at the following three levels:

Strategic vision

Know what you want, based on knowing who you are and what you want to achieve. This is about an awareness of personal goals and values. It can be very explicit, translated into formulated criteria, or very implicit, in which case there is an intuition that can be used to judge examples and design choices. Both approaches can work; more often than not, they co-exist in some form. Whatever it is that you’re going to make, you have to feel its soul and formulate its mission. There is probably no better example here than Steve Jobs, who has always had a very specific vision about using computing technology for personal goals, as opposed to serving the needs of businesses or governments. Apple was founded in 1979; over 30 years later, his vision has become a reality. Every product Apple has produced under Jobs’ guidance was a conscious materialization of that vision. On a more intimate level, amateurs who want to redecorate their homes will be stifled rather than liberated by all the choices and possibilities if they do not have some kind of understanding of what kind of ‘vibe’ or ‘atmosphere’ they want in their house. They, too, need a vision. There is no other way.

Tactical choices

Be able to make choices that determine what it is that you are making. What you are making is ultimately a design that can be produced, in order to make the vision a reality. We are caught between heaven and earth here, and this is the true level where design takes place: crucial decisions are made on a conceptual level that will eventually determine the details of the end result. Choices about content, structure, behaviour and form are made and fixed. This is where professional design becomes a profession, and craftsmanship begins to play a role. The question is: how much professional expertise is needed? Can this be done by an amateur? **AMATEURISSIMO** It’s hard to have to start from scratch. Tweaking something that’s already close may be a better way to go. Open design to the rescue! If you see something you like, just download it and modify it to represent your vision. We’ll return to that later.

Operational skills

Be able to use available production tools and infrastructures. This can range from knowing how to point and shoot with a digital camera or upload a video to YouTube to making a final mix of a song that sounds good on different speaker systems or specifying a design with 3D modelling software for a 3D printer.

These are the pillars of what we can call ‘design literacy’: the development of vision (strategic), the formulation of a design (tactical), and technical production (operational). There are interesting interactions between the three levels, however. Ultimately, available production tools and infrastructure determine what can be made in the first place, so operational skills and tactical choices are often strongly aligned. There are also crucial links between tactical choices and strategic vision. If a 3D modelling tool is very user-friendly, very responsive, and well connected to the production tools (possibly through data standards), then the boundary between a sketch and a final design starts to blur, and users can work in a state of flow, where all three levels are active simultaneously.

ONLINE ENVIRONMENTS PROVE THAT WELL DESIGNED INFRASTRUCTURES CAN FACILITATE PERSONAL EXPRESSION ON A MIND-BOGGLING SCALE, BUT THEY HAVE ONE THING IN COMMON: SIMPLICITY.

The distinctions between the three kinds of literacy are epistemological: they involve different kinds of expertise. All three involve mentality, knowledge, and skills – three very familiar pedagogical concepts. Thus, design literacy can be learned, just like many other things, but there’s more to it than learning to work the tools.

Becoming Literate

Professional designers **DESIGNERS** have all the necessary expertise. They have an important role to play in the large-scale development of design literacy. They can be heroes when their high-quality designs inspire eager amateurs. They can produce examples to be shared on online platforms that can be used, modified and re-distributed. They can explain how they work, e.g. as teachers in face-to-face courses and online videos. In working towards the advancement of design literacy, professionalism is still our starting point. Going back to the three central concepts of design literacy mentioned above (vision, design, and production), there are interesting opportunities and challenges in the organization of design literacy:

Strategic vision

The development of a personal vision can be facilitated by presenting, explaining and discussing high-quality designs from professional designers. The development of vision can be a vulnerable and intuitive process, and seeing how pros do it (in a video interview, for instance) can be very helpful and inspiring. Formulating the right question is often the best way to try and find a solution. Inspiration is the keyword here: designers can be inspiring through what they make, but also through showing how they came up with the right vision to begin with.

Tactical choices

The formulation of a design can be facilitated by the same high-quality examples, when they are published in ways that allow for inspection, modification and sharing. Open design plays a crucial role in this. Online environments that feature collections of high-quality examples that can be analysed, used, modified, discussed and re-published hold immense potential. Users need to be able to inspect the internal structure of a design, and then modify and share it. Designers can produce these examples and share their methods and insights in interviews or debates, and design teachers can develop new pedagogical methods and formats. In the world of digital media, users make mashups, [REMIX](#) devising new combinations of chunks of information found elsewhere to create coherent new constructs. Open design allows for a similar approach to 3D objects, physical equivalents to mashups that can also be shared and discussed with others.

Operational skills

Technical production is the easiest skill, since all it requires is decent interface design for the relevant tools, supported by access to technical knowledge in the form of instruction manuals in print, video, or other formats. Many people can teach themselves how to do this and help each other using social media, such as forums or blogs.

Not everything can be done exclusively in the digital domain. There is definitely a need for face-to-face encounters with ‘designer heroes’, design teachers and fellow design amateurs. There is a potential here for existing cultural institutions like public libraries, archives and museums to organize the exchange of knowledge [KNOWLEDGE](#) between pros and amateurs, as well as but just as much between amateurs and other amateurs. They can become hotspots in the real world where amateurs go to work on their expertise. STEIM is an example of such a hotspot.

Design into the Future

The STEIM story below illustrates a shift in the focus of skilled professionals: from high-quality production to high-quality coaching and education in order to facilitate expression and reflection in a larger community of passionate amateurs. Such a significant shift does not happen out of the blue; it is a deliberate choice and it takes real work, based on an informed awareness of how our world is changing. [REVOLUTION](#) This new mentality is the ideal complement to the exchange of information and ideas that is made possible through open design and new technological infrastructures. This calls for an ecosystem of people, institutions, relationships, tools and open infrastructures, where design becomes a natural activity for all those involved. Deliberate initiatives to foster design literacy need to address the three levels discussed above. Open design is essentially a highly social affair: amateur users will gather in online environments that help them by offering good examples in the form of available open designs, which are accompanied by interviews with heroes that explain how they navigate through all three levels of literacy. Heroes are attractors; people will flock around them, learn from them and from each other. Some parts of this ecosystem will grow and flourish autonomously, but others will need to be very consciously designed and planned in order to create a vibrant and living environment. It will help us find inspired ways to deal with tough issues like identity and choice in complex and unpredictable networks.

THE STEIM STORY

STEIM is a laboratory in Amsterdam that experiments with electronic musical instruments for live performance. This was a very specialized affair in the 80s and in the 90s. STEIM's instrument designers would develop personal instruments and user interfaces for musicians. They became world-famous for their expertise in connecting musical goals (strategic) to technical solutions (operational) through skilful design (tactical).

During the 90s, however, sensor technology and software became more widely available and more affordable. At the same time, the internet became a widely used platform for sharing knowledge and solutions among musicians. STEIM's core activity became a DIY craze. STEIM consistently supported this trend, being one of the first organizations to hack cheap Wii controllers for musical

applications and publishing electronic diagrams for its best-known musical instrument, the crackle box. But as this was happening STEIM and its professionals had to reorient themselves to the changing situation.

Nowadays, STEIM is an important node in a world-wide knowledge network. There are more workshops than ever before. Moreover, starting in 2011, STEIM will offer a master's degree in 'Instruments and Interfaces' in collaboration with the Royal Conservatory in The Hague. It has become a vibrant hub for learning about DIY instrument design and meeting other people with similar interests. There is a strong co-creation culture. Musicians are challenged to develop their personal ideas about the kind of music they want to make (strategic vision), and STEIM helps them develop their ideas, through co-design (tactical choices) and co-production by means of software configuration and the building of physical objects (operational skills).

Many people who visit STEIM don't just leave with an instrument; in their time there, they have learned how an instrument is made. And the instrument is just the beginning; there needs to be substantial time spent in learning to play it, as well as resisting the temptation to tweak it further. This represents a big risk at the tactical choice level: know when to stop modifying and start using a product! This is expertise that transcends the operational level. This is years and years of experience feeding into how musicians are currently coached and educated.

www.steim.org

Written by Caroline Hummels and published in *Open Design Now!*

TEACHING ATTITUDES, SKILLS, APPROACHES, STRUCTURE AND TOOLS / CAROLINE HUMMELS

Taking a critical look at current educational models, open design will involve a shift in the relationship between designers and potential users in terms of attitude, skills and approach. Caroline Hummels discusses the consequences of open design for the educational approach and for the structure and tools offered. She advocates an educational model that reflects the flexibility, openness, and continuous development of open design.

Caroline Hummels

Does training for open design require a different style of education? Current initiatives like Linux, VOICED and Fab Lab show the beauty of open platforms for sharing and learning without requiring its contributors to follow specialized **AMATEURISSIMO** education. Despite this innate advantage, an educational model that is slanted specifically towards open design is needed. This chapter discusses how we can shape that model in such a way that it enables designers to blossom in an open structure. Although I focus on design education, the model can also be applied to other fields of expertise.

The Aim and Focus of Open Design

So why do we need a specific education style to facilitate open design? In fact, we don't. I do, however, believe that education should reflect upon its own paradigms, and envision what types of designers society will need in the future. Open design is one of the reasons to look critically at current educational models. Society is always changing. **REVOLUTION** What that means right now, for example, is that we have to be able to deal creatively and flexibly with large amounts of constantly evolving information. It also means that we currently have to find answers to large societal questions, now that we have reached the limits of our financial and environmental ecologies, among other frameworks. Open design addresses and works with these overall trends. **TRENDS**

Open design assumes open access, sharing, change, learning and ever-evolving knowledge and skills. It is an open and flexible platform instead of a closed one. Consequently, open design emerges from the New Science paradigm of quantum physics, relativity and self-organizing structures, developed by such scientists as Einstein, Bohr and Prigogine.¹ Where Newton's classical-scientific view is essentially simple and closed – it can be modelled through time-reversible laws and all complexities can be reduced to simplicities – Prigogine's reality is multiple, temporal and complex. It is open and admissible to change.

Design education based on a New Science paradigm requires a transformative curriculum, according to Doll². In such a transformative curriculum, teachers discard the God's-eye view, uniform curricula and tests that are considered objective and predictive. On the contrary, they emphasize and support a variety of positions, procedures and interpretations. Design education for open design could benefit from theories like Constructivism, where learning is the learner's active construction of meaning in context.

OPEN DESIGN IS BASED ON A LIBERTARIAN RELATIONSHIP BETWEEN DESIGNERS AND POTENTIAL USERS, AND NOT ON A RATIONAL ONE IN WHICH THE DESIGNER IS SEEN AS SUPERIOR.

It is possible to postulate what educating for open design could look like, based on a constructivist learning model. The educational model for open design described below addresses attitudes and skills, approaches, and structure and tools. The figures in the text exemplify these topics by showcasing the educational model we use in the Department of Industrial Design at Eindhoven University of Technology.

Learning the Attitudes and Skills for Open Design

In his book *The Craftsman*,³ Richard Sennett describes the importance of a craftsman's intrinsic motivation, commitment to doing good work for its own sake, and an ongoing pursuit of mastery in his or her craft. This attitude is the basis for the success of open communities like Linux, where the reward system is based on the quality of the outcome, social appraisal within the group (peer review) and the personal development of the contributors. The success of open communities like Linux depends on a set of attitudes, skills and activities that foster learning from experience, developing skills through doing, curiosity, ambiguity, imagination, opening up, questioning, collaborating, open-ended conversation, experimentation, and intimacy. It is these attitudes, skills and activities that will also determine the success of open design.

I therefore consider it essential that design education focus on forming self-directed and life-long learners, who are intrinsically motivated and who take responsibility for developing their own competencies and delivering high-quality work. Design students should learn to trust their senses and their intuition, and to embrace ambiguity, open-endedness and experimentation, as explained in the next section on approaches to open design. Moreover, design students should develop the attitude geared towards collaboration, **CO-CREATION** preferably supported by methods, tools and structures that foster collaboration (as explained in the last section on structure and tools for open design). It is not only designers who are participating in open design; in principle, everyone can participate. The key aspect is that everyone contributes their own expertise, while respecting and building on the expertise of others. This is especially true when addressing larger societal questions and designing systems where expertise is needed from a range of fields, including design, social sciences and engineering. **KNOWLEDGE**

Blurring Boundaries

Open design implies that the boundary between designers and users is blurring, at least with respect to motivation, initiative and needs. So what does this mean for the interaction between designers and potential users? On the basis of my organizational classification,⁴ open design is based on a libertarian relationship between designers and potential users, and not on a rational one in which the designer is seen as superior. Neither is it based on an integrating relationship, in which the designer looks after the interest of the majority of potential users. The libertarian approach emphasizes the freedom and personal responsibility of every individual. This means that the designer is no longer placed above users when determining what is right for them; rather, the designer is part of a larger community.⁵

To be clear, this does not imply that everyone now becomes a designer, as IKEA and many others are implying. **WYS ≠ WYG** The design profession is still something that requires many years of education and practice, like any other profession. It does mean, however, that potential users now add their own experience and specific competencies to the mix.

Based on the aforementioned, I consider it essential for current design education to teach students to cooperate with other experts, respecting their expertise and simultaneously reflecting on their own competencies. This means, for example, that design students need to learn to work as part of multi-disciplinary teams, collaborating with students from other departments and schools, both on the same level and on different levels, e.g. students from a regional training centre, a university of applied sciences and a university of technology working together on projects. Moreover, design students need to learn to collaborate intensively with potential users, not as objective researchers that perform one or several user studies, not merely as facilitators that run co-design sessions, but also as subjective participants in an intensive process in which they themselves are part of the solution.

The Approach to Open Design

Due to the flexibility, open-endedness and often innovative character of open design, students should have first-hand experience with the fact that design decisions are always conditional; such decisions are always based on insufficient information, are but taken to the best of their and the community's experience and knowledge at that point. They can use two strategies to generate information to support these decisions, which reciprocally provide focus: design making (synthesizing and concretizing) and design thinking (analysing and abstracting).

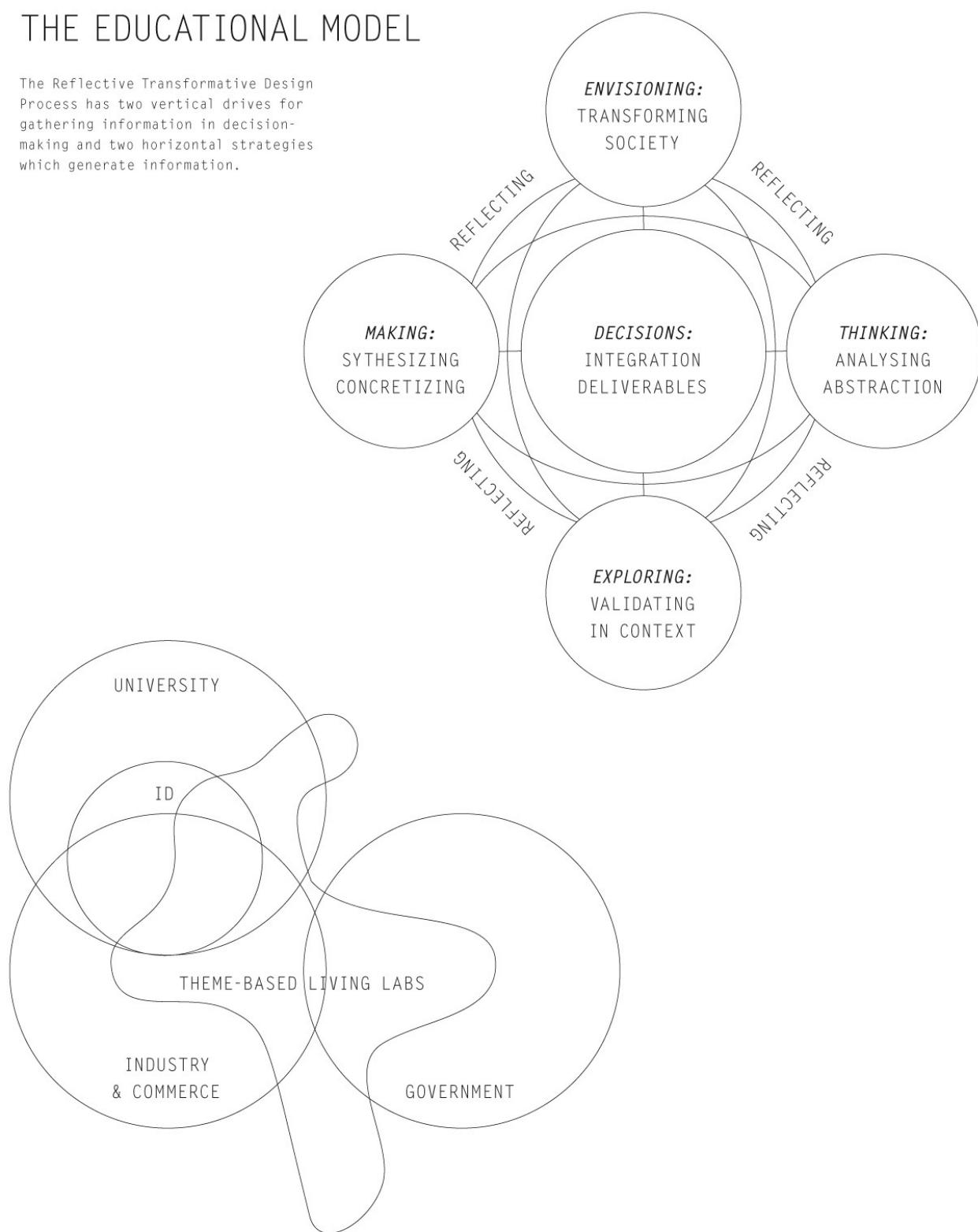
Since open design depends highly on different people and expertise, including the element provided by potential users, tangible solutions that can be experienced are essential throughout the design process to validate ideas and to guide further developments. **STANDARDS** Moreover, design-making opens up new solution spaces that go beyond imagination, especially in group settings and when focusing on innovative, disruptive products which lack a well-established frame of reference for users or the market. It recalls the adage 'quality through quantity'.

I consequently advocate that design students learn to use a highly iterative process of generating dozens of solutions and testing them *in situ*, in their proper context. The Reflective Transformative Design Process⁶ offers such a flexible and open process that it regards the act of designing not only as thought, but as a generator of knowledge. The process supports developing a vision of social and societal

transformation, exploring solutions *in situ* with others, as well as offering moments of reflection.

THE EDUCATIONAL MODEL

The Reflective Transformative Design Process has two vertical drives for gathering information in decision-making and two horizontal strategies which generate information.



Thematic 'living labs' are used as carriers for joint education, research and valorization. Each theme has its own space that is used as education/design studio, research lab, library, workshop and test bed,

with satellite test beds in the city. This approach is intended to create an open and flexible organization, demanding more responsibility and engagement from all participants.

Structures and Tools for Open Design

Open design requires a place to co-operate. That said, a hybrid design environment would both take advantage of a digital space that is always available all over the world, while making use of the intensity of collaborating in a physical workspace, making things, exchanging ideas and knowledge, and testing designs in context with potential users. A beautiful example of such a hybrid community is Beppe Grillo's blog,⁷ which enables people to share digitally **COMMUNITY** and to meet each other all over the world. What does this mean for design education? Faculties, departments and schools have to think both physically and virtually about workspaces that enhance collaboration. **CO-CREATION** At the Department of Industrial Design here at Eindhoven University of Technology, we have structured our workspaces thematically to provide areas in which students can work together, share expertise and learn from each other. In addition to a supportive structure, open design would benefit from tools that support designing and sharing, for a variety of contributors. Design education can support students in exploring these tools through methods such as participatory design, co-design or rapid prototyping equipment at Fab Labs. Universities and schools can also develop open design tools and methods, such as Skin 2.0,⁸ the Fab@home printers or design tools developed by former ID students at Studio Ludens.

Conclusions

Open design not only forces designers to think about their profession, role, attitude and competencies, but also challenges design educators to scrutinize their educational system. In this article I have discussed what open design means for the designer's attitude, skills and approach as well as for the educational structure and tools offered. Since we have stressed the flexibility, open-endedness and often innovative character of open design, the educational model for open design will also be flexible and open, and will need continuous development and testing with all parties involved to become a truly open design system.

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2. Idem. [←](#)
3. Sennett, R, *The Craftsman*. London, Penguin Books, 2009. [←](#)
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8. Saakes, D, *Shape does matter: designing materials in products*. Doctoral dissertation, Delft University of Technology, 2010. [←](#)

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<http://opendesignnow.org/index.html%3Fp=425.html>. Accessed Jan 13th, 2017

Written by Gabrielle Kennedy and published in *Open Design Now!*

JORIS LAARMAN'S EXPERIMENTS WITH OPEN SOURCE DESIGN / GABRIELLE KENNEDY

The mediocracy of the middle classes dominates the current mass production design. In a world less controlled by branding and regulations, a new breed of designers can contribute to an altered, more honest economy. An interview with Dutch designer Joris Laarman, contemplating his relationship to modernism and the modernist roots of open source design and digital fabrication.

Gabrielle Kennedy

There's always something special about the top crop of Dutch design graduates, but every once in a while one comes along that makes everyone sit up and take notice. In 2003, that was Joris Laarman. His *Reinventing Functionality* project at the Design Academy of Eindhoven fused function with ornament and was snatched up by Museum Boijmans Van Beuningen in Rotterdam.

DESIGN MUST ACCEPT SOME OF THE RESPONSIBILITY FOR CREATING MANY OF THE WORLD'S CURRENT PROBLEMS.

Since then, he has earned a reputation for himself as a designer with visionary ideas and a concern for societal issues. His first project out of school, the *Bone Furniture* range, was exhibited in the Friedman Benda gallery in New York, a limited edition series made from marble, porcelain and resin. While he calls it an "annoying coincidence" that much of his work has spawned major contemporary trends, it also testifies to its relevance to the issues that matter.

Furniture That Can Be Grown

Both those early projects clearly expressed Laarman's highly specific views on modernism. The *Bone* range [DESIGNERS](#) resulted from a cooperative partnership with car manufacturer Opel, using software to design a series of artworks based on the organic way that bones form. Car parts are designed with the help of topology optimization software to increase strength and maximize the efficient use of materials. Furniture, as it turns out, can also be 'grown' by adding and removing material to maximize its strength and functionality.

Laarman's stance is that functionality and extravagance are not mutually exclusive. Where modernism went wrong, and how its core advantages need to be readdressed, are what drive his research. What he is looking for are design solutions that possess a revolutionary quality. Much of his current research repudiates how things are currently done and patiently pursues a better way not just to manufacture, but also to distribute design.

Seen in this light, design must accept some of the responsibility for creating many of the world's current problems. More importantly, it can play a key role in fixing them. In 2009, Laarman opened his Amsterdam studio to the public for the first time. His purpose was to share his thinking and his process. He wanted to reveal how design experimentation and research can create answers, not just pretty objects.

"In galleries and in Milan, people only ever see perfect pieces," he says. "In this exhibition, I wanted people to see the research part of design, what is behind all the pretty shapes, and how they could eventually be of use in the world. I wanted people to understand what the future of design could look like using technological progress."

Laarman hit a wall when he was researching open source design and digital fabrication. He realized that design had taken a wrong turn somewhere along the way and was now failing society. "I am not necessarily against how design is now," he says, "but I do think the internet can provide a more honest way to design, make, distribute and sell things." Not modernism, then; what's needed is a new *-ism*.

It takes some audacity for such a young designer to criticize the industry. Laarman has gone beyond theoretical criticism, underlining his opinion with some tangible ideas that he wants to try out – hopefully with the support of his contemporaries.

I DO THINK THE INTERNET CAN PROVIDE A MORE HONEST WAY TO DESIGN, MAKE, DISTRIBUTE AND SELL THINGS.

"I started to think of my work and of design in general as a sort of laboratory," Laarman says. He explains it as a place where solutions might be found to the predicament created by over-production in the post-industrial age. "I'm not condemning the whole design industry," he says, "or even questioning it. There is a lot of very good industrial production, and that will never go away, but I think it will soon be joined by another revolution made possible by the internet." [REVOLUTION](#)

Despite its failures and the role it played in creating over-production, Laarman's research kept bringing him back to modernism – not as an aesthetic per se, but as a philosophy. In 2010 Laarman was selected by Ingeborg de Roode, curator of industrial design at the Stedelijk Museum in Amsterdam, to participate in the Modernism Today series. "I guess she sees me as a sort of contemporary version of Rietveld," [DESIGNERS](#) says Laarman. "That is an interesting comparison, and I see some connection." 100 years ago, Gerrit Rietveld experimented with technology and materials; Laarman does the same today. His aesthetic is not in the tradition of De Stijl, but his values most certainly are.

The Modernist Roots (of Open Design)

In line with those values, it made good sense to fuse Rietveld's world of ideas and experiments with open source design and digital fabrication; both could be argued to have modernist roots. Open source has been revolutionizing the cultural content universes of music and software for almost a decade, so why shouldn't it also be able to change the way design is both made and distributed?

"I think true modernists wanted open source design one hundred years ago," says Laarman, "but back then it wasn't possible. Rietveld published manuals about how to make his chairs, but nobody could really use that information, because there were no networks of skilled artisans. His designs look simple, but are difficult to construct. These days, we can distribute knowledge in a way that can potentially bring craftspeople back to the centre stage of design – not in an idealistic, naïvely romantic way, but in an economically sound way. All we need are the networks, and cheaper and more accessible digital manufacturing technology." One of modernism's core flaws was the huge amount of power that ended up in the hands of a few big factories and design firms. The movement was supposed to be about the democratization of design – that was their big idea – but somewhere along the line it became nothing more than an aesthetic. Of course there are some obvious differences between modernism and open source design. Modernism produced an international and generic style. Industrialization led to mass production, which meant production had to be centralized and its products transported across the globe from countries with the lowest wages at great environmental and economic expense. Information and knowledge were kept closed and protected by copyrights; even if they had been accessible, it would have been impossible for an individual to use the design data without access to exorbitantly expensive production tools. The quality of design produced was and continues to be guaranteed by the producer; in turn, the producer and the retailer divide the majority of sales revenues.

I THINK TRUE MODERNISTS WANTED OPEN SOURCE DESIGN ONE HUNDRED YEARS AGO.

Open source design, on the other hand, has the capacity to conserve culture and decoration as well as traditional skills by utilizing new technology.

Digital production makes mass customization possible. Open source makes information and knowledge public; in addition, it has low entry costs, quality control takes place in the form of peer review by the public, and revenues are divided between craft and creativity. Also, because the products of open source design can be produced locally, transportation costs are drastically reduced.

What open source design does is redistribute knowledge [KNOWLEDGE](#) and the means of production. It has the potential to change everything that we know about design, from manufacturing to education. Open source design is anti-elitist insofar as it can create fairer and more honest prices. It is democratic and helps to create self-determination in an individual's immediate environment. Ultimately, it takes power away from the huge multinationals and from production hubs like China and India and hands it back to craftspeople – those individuals rendered irrelevant by industrialization. In short, open source design could feasibly become this century's new-*ism*.

ULTIMATELY, IT TAKES POWER AWAY FROM THE MULTINATIONALS AND PRODUCTION HUBS LIKE CHINA AND HANDS IT BACK TO CRAFTSPEOPLE – THOSE INDIVIDUALS RENDERED IRRELEVANT BY INDUSTRIALIZATION.

"This does not mean that any one can make good design or that more rubbish can be produced," Laarman says. "Just because everyone has a digital camera doesn't mean that everyone is a photographer. I am not in favour of amateurism, but the way I envision the system working, the good will eventually be filtered from the bad." [AMATEURISSIMO](#)

COMPOSITION OF SALES PRICE

Under the current system, a designer takes his or her design to a manufacturer, who makes it and then takes it to a shop that sells it. If he is lucky, the designer gets 3% ex factory, The brand adds 300% and the shop doubles that again.

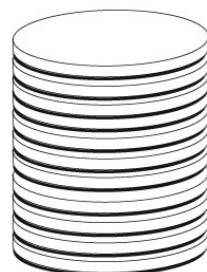
RETAIL



BRAND



FACTORY



DESIGNER



Less Production Is Needed, Not More.

Statistics show that up until the Industrial Revolution, a similar amount of products were being produced every year. With industrialization came increased wealth and prosperity, which lead to massive increases in production. The result was more waste, more environmental damage [TREND: SCARCITY OF RESOURCES](#) and a surge in unemployed artisans. The average Western person today has access to more things than Queen Victoria owned during her reign. “The tragedy is that the vast majority of what is being today made lacks creativity and quality and isn’t really needed,” Laarman says. “The over-production of mediocrity for the middle classes has created a difficult economic situation, and there is nothing that can be done about it within the current system.”

If digital design went local, imagine what this would mean for small producers. “Right now, most people are just talking about digital fabrication,” says Laarman, “but it is happening, and I think can eventually take over. I am not going to say it will change the world, but it will change the way things are made. 3D printing is still very limited, [AESTHETICS: 3D](#) especially in terms of materials, but as digital manufacturing technology evolves, anything is possible.”

One possible scenario would be for local communities to invest in technology. “There are already all kinds of initiatives popping up that give individuals the opportunity to start their own small production facilities,” Laarman says. “We are looking into setting up a sort of professional Fab Lab, for instance, where any design based on a digital blueprint could be mass-customized and made.”

It could work. The RepRap machine, for example, is an open-branded DIY 3D printing machine. [HELLO WORLD](#) The RepRap is a machine that you can make yourself (and that can reproduce itself!) [REPRODUCTION](#) that can in turn make other gadgets. “Right now, this sort of thing is the domain of geeks for geeks, but once it becomes more professional, it will be ready for more general usage,” Laarman says.

THE AVERAGE WESTERN PERSON TODAY HAS ACCESS TO MORE THINGS THAN QUEEN VICTORIA OWNED DURING HER REIGN.

Open source design and local digital fabrication could also revolutionize education, which has mostly become outdated and irrelevant. “We could tie the platform into trade schools,” Laarman says. “Education has fallen behind and kids are not being taught what is needed. Digital manufacturing should be taught in schools, especially at the vocational school level.”

These developments are slow, however, because open source design remains the great unknown, with many unanswered quandaries. The new, innovative nature of the ideas works both for and against them; instead of inspiring images of a world less controlled by branding and regulations, open source design ends up sounding chaotic, with too much choice and an over-abundance of experimentation and waste. Issues of copyright and profit-sharing scare off many, leaving a lot of the earliest experimental platforms looking unprofessional and insecure. [MANIFESTOS](#)

But the problem for most of the current websites selling open source design is they lack professional participation. What’s needed is more of the best and most visionary design minds debating and devising ways to make it all work. “What is happening so far isn’t really making a difference, but it does show that there is huge potential,” Laarman says.

Creative Commons [CREATIVE COMMONS](#) has made some interesting inroads. It is a new type of copyright that protects a designer (or anyone else) so that they can make licensing agreements with suitable producers or limit use of their ideas to personal use only. “It works in an idealistic sense if everybody plays nice,” says Laarman. It is still limited, though, and resembles a small-scale iTunes dominated by amateur musicians playing a limited number of instruments. What is needed next is a professional digital platform, or a network where people can meet, access and share information about how and where to have design digitally manufactured.

DIGITAL MANUFACTURING SHOULD BE TAUGHT IN SCHOOLS, ESPECIALLY AT THE VOCATIONAL SCHOOL LEVEL.

Make-Me .com

One exciting project already under way, albeit in its nascent stages, is [Make-Me.com](#), a cooperative venture involving Laarman, the Waag Society, Droog Design and some early internet pioneers. For designers, it means uploading their design for general distribution. For consumers, it means being able to access and customize design. For local producers, it means using licensing agreements to make the things that people want. “It reduces our carbon footprints and allows for more customization,” says Laarman.

THAT IS WHAT WE DO. WE TAKE SOMETHING FROM THE PAST AND SHAPE IT INTO SOMETHING NEW.

[Make-Me.com](#) plans to operate like an app store. You go there to get what you want. Some of it is free and some of it is paid for; some are designed by amateurs and some by professionals. “The amateurs and the professionals have to compete against one another,” Laarman says. “You find the chair you want online via us and you go to the local Fab Lab to have it produced on the spot. The platform is linking consumers to craftspeople and digital fabrication tools.”

[Make-Me.com](#) as an open source platform is not limited to design. “It is for journalists, architects, businesspeople, scientists – even a place you could go to for a new haircut,” says Laarman. Big pharmaceutical companies, for example, don’t want to invest in research on diseases that only affect small numbers of people, because there is no money to be made. An open source platform could open up possibilities for DIY bio-labs where scientists and doctors could access research and make their own medicines. “Anyone can use [Make-Me.com](#) to distribute information in a new way.”

Designers, however, fear what all this means for them in terms of copyright. They think production companies protect their intellectual property, the quality of their designs, and guarantee them an income. What that fails to recognize is that copyright is a complicated question. Who really owns an original idea? Is anything truly and completely original? Every creative person pilfers and borrows ideas from everywhere; referencing what came before is a natural part of the creative process. “That is what we do,” says Laarman. “We take something from the past and shape it into something new.” [REMIX](#) Via Creative Commons licensing, it might become possible to profit from someone stealing your idea.

What limits the scope of open source at this point goes beyond legal concerns. For it to work, a whole new economic model would need to be devised and accepted. Under the current system, a designer takes his or her design to a manufacturer, who makes it and then takes it to a shop that sells it. “If he is lucky, the designer gets 3% ex factory,” Laarman says. “The brand adds 300% and the shop doubles that again. It’s ridiculous how little of the cut a designer gets. If we used digital tools and changed the way stores work, the ratio would be able to favour creativity and the craftsman.”

However, test-driving a new model will require a platform like [Make-Me.com](#). It has to be large scale, and it will need to attract big-name designers and brands so that people can see it working. It’s a tough chicken-and-egg situation: unless designers feel that their financial income and copyright dues are guaranteed, they are not going to take the risk – and without enough designers taking the risk, it will be virtually impossible to erect the solid infrastructure to ensure smooth, safe and legal operations. It will take a coordinated leap of faith from educational facilities, designers and craftspeople for anything like this to work.

None of these obstacles are insurmountable. What Laarman wants is to be a part of the experiment and to be a contributing member of that generation who will be defining the parameters and creating the way forward. It is that vision which distinguishes him from a lot of his contemporaries – he has the commitment and the patience. He knows that this is something big and wants to do whatever it takes to make it work. “Right now, I am making very expensive, limited-edition designs,” he says. “That is a good way to fund the experiments and start a business, but eventually what I’d like to be able to do is provide open source versions of my work for everyone. That is my goal.”

He knows he doesn’t have all the answers, but Laarman is working through all these problems one by one. “I don’t want to say that this idea could take over the entire production world,” he says, “but it can certainly help craftspeople to make things that are not standardized or mass produced. If a world-wide network of craftspeople grows, then this could potentially really change things.”

Closed Societies Fail

Whichever way you look at this, design cannot continue as is. Design reveals a lot about society, and closed societies fail; like organisms that shut themselves off from their environment, a society that shuns reality will eventually die. Likewise, closed design is outdated. Open source, whether it can be what designers want or even understand at this point, is one way for design to play a real role in building a new, more honest economy. A world with less mass production, less waste, less transportation and less standardized design [STANDARDS](#) can only be interpreted as a win-win situation for all concerned.

Another decade of discussion is needed before open source design will ever be able to make a tangible difference. Interestingly, the same arguments being used against the phenomenon now are the very same arguments that were once used against the introduction of democracy. The ruling elite will always feel threatened by the idea of giving power to the people.

WHAT I'D LIKE TO BE ABLE TO DO IS PROVIDE OPEN SOURCE VERSIONS OF MY WORK FOR EVERYONE.

Open Structures: Thomas Lommee

In this lecture, Thomas Lommee discusses modular systems and their implications for design.

Youtube: [Open Structures: Thomas Lommee at TEDxEutropolis \(12:10\)](#)

Jefferson's Gravestone: Metaphorical Extensions of Design

Jefferson's Gravestone: Metaphorical Extensions of Design (p. 117-133) in Design and Truth by Robert Grudin.

Writing prompt

In this chapter, Grudin takes us on a foray through literary design, social design, and of the qualities that make for a good designer and design leader. Grudin tracks the emergence of design as a concept, and various evolutions of what the process according to historical designers, all adding up to the "magical idea" of design that can be a "metaphor for creative thought in any area."

Describe an instance in which you designed something, from conceiving a plan in your head through a finished product. What kind of design process did you engage in? Describe your motivation or any significant context, but focus on summarizing your design process and how it affect the end product. Did you work with a group or solo? How did that affect the results?

Connect your example to the reading. Which of the historical or contemporary design approaches mention by Grudin can be related to your process?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Liberty as Knowledge Design

Liberty as Knowledge Design (p. 134 - 149) in Design and Truth by Robert Grudin.

Writing prompt

In this chapter, Grudin dissects the design challenges inherent in a society built on democratic values. He walks through the decline of intellectualism in Bagdad, the once preeminent hotspot for free thought on the planet, into the rise of liberty in other parts of the world. Grudin lays blame over the last 100 years of declining liberty in the United States to the failings of education to teach the value of liberty and civic leadership to its citizens.

For this prompt, I'd like you to consider your thoughts on the link between intellectualism, education, and free expression. Have you ever felt a sense of civic duty? How have you expressed that in public society — or how might you? How could design play a bigger role in political discourse?

Do you see a role for education in the conversation between civics and design?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Corporate Redesign and the Business of Knowledge

Corporate Redesign and the Business of Knowledge (p. 150-165) in Design and Truth by Robert Grudin.

Writing prompt

In this chapter, Grudin describes arguments over imbuing corporate free market endeavors with moral imperatives, one of which is truthfulness. He also draws correlations between communication of knowledge within a company and its health. He examines Google as a case study in corporate knowledge investment and makes the case for the Chief Knowledge Officer.

Let's say you were hired, just as Grudin was, to be a consultant for a large company. How might you redesign the knowledge embedded within that company or its products? What challenges would you face as a Chief Knowledge Officer or implementing design ideas in corporate settings in general?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Designing Time

Designing Time (p.166 - 177) in Design and Truth by Robert Grudin

Writing prompt

In these chapters, Grudin discusses the dimensionality of temporal design from examples of storytelling, music, sports, rhetoric, and marketing. He also speaks about contrast being the differentiator between *designing* one's time and *managing* one's time. Grudin again reflects on his "intentional" day and what it actually means to be intentional.

Do you agree with assessment that modern institutions have given up satisfying needs that cannot be bought and sold? Think about what inspires, energizes, or brings you delight. What are those things? Suppose you are working in a design studio or company (you can choose which kind). You are the new hire and are asked to propose to your boss how they might incorporate some activity into the workplace that fulfills the need for delight, inspiration, or energy. What would you propose?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Open Design Project



Brief

In this project, you will follow the Double Diamond design process to: (1) design a kit of parts that can be used to build a toy, model, or other object for use by human people; (2) write comprehensive instructions for how to make the parts and assemble the kit; and (3) create photo documentation of your work.

This object will be a collection or kit of parts that can be reconfigured to create variations. This is serious (though playful) product design. You can create your own custom parts from raw materials like cardboard, wood, foam, and others, or found objects like rubber bands, toothpicks, paper clips, etc. A **part** is a discrete element and is different from an **ingredient** in that it maintains its structural integrity when it's separated, whereas an ingredient gets combined and can not be separated again without a complex separation process. *Ingredients should not form the basis of the toy.*

The primary goal of this project is to apply open design concepts to creating object using commonly available resources, and empower others to do the same. Secondary goals are to become familiar with product and market research, gain experience with user testing and feedback, practice presenting design process, produce knowledge design, and explore the [IKEA effect](#) for products. [Read more about the IKEA effect.](#)

Note: Remember, none of this is fiction. You are creating a real instruction set with everything needed for the end user to do this on their own. If you are incorporating templates, include them in the instructions for your users.

Background

According to the most [recent and comprehensive data](#), 10.7% of the world's population lives in poverty, so the easier and cheaper it is for others to create or obtain your parts, the more accessible your project will be.

Originally conceived by the Institute Without Boundaries, the [Open Structures project](#) has defined design guidelines to aid the users of the design framework: (1) Design for disassembly, (2) Design with recyclable materials, (3) Design from the OS grid. They are concerned that the objects can be taken apart once built, that they don't harm the environment if discarded, and that anything designed with the system will be interoperable. One project which also fits these guidelines is called [OffBits](#), an open-source toy designed by a team in Tel Aviv that incorporates community challenges and up-cycled parts.

Inspiration

- [Nintendo Labo](#) — Not entirely "open," but an excellent example of IKEA affect in product design.
- [Make](#) — Blog of maker projects and tech crafts.
- [Instructables](#)— Amazing DIY tutorials
- <https://hackaday.com/>
- [Craftster](#)— Tutorials
- [GetCrafty](#) — Craft forum
- [Lifehacker](#) — Some fun tutorials about hacking objects in unexpected ways.
- [Cubeecraft](#) — Simple papercraft templates.

Previous student work

"Magnection" by Daniel Bershefsky, 2017: [Download \(10MB\)](#)

Requirements:

1. Parts should be simple (avoid parts that are difficult to construct or provide instructions for constructing).
2. A kit should have more than one part (parts may be the same).
3. Materials should not cost more than \$10.
4. You should be able to assemble **three** distinctly different objects with the same kit, tools, and assembly processes.
5. Everything needed for another person to follow your instructions must be included in the PDF. This may include templates. Remember, this is an open source kit, *not a boxed toy available in a store*; everything a person needs should be in the instructions or commonly available.
6. Do not include another person's copyrighted work in your project that is not appropriately licensed. Typically a Creative Commons License will be needed. The project must be mostly your work, and should not rely on the design work of others.
7. No weapons. We can define weapon as a device that uses projectiles powerful enough to cause harm to others. For example, a small-scale table-top device that shoots paper or foam projectiles as part of a game objective is fine. A handheld slingshot with the ability to propel objects at other people is a weapon.

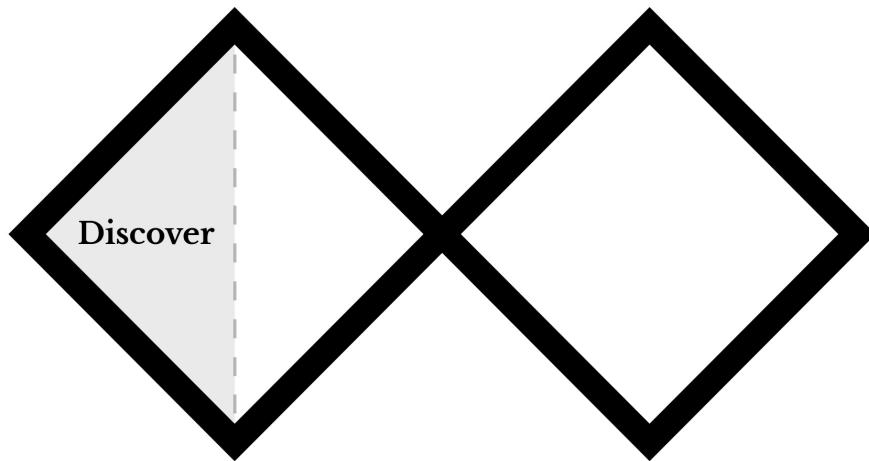
Tips

Make it original: There are many examples of modular toys and kits in stores and on the Internet. If you decide to take direct inspiration and remix other works and ideas, you must ensure that there is a good balance between copying, transforming, and combining. There must be some novelty in your work, and it should be obvious that this project came from you.

A good way to create novelty with household objects is to substantially transform the shape through manipulating the materials. Rather than using a paper cup as is, transform it into a *designed* module.

Make it fun: The kit should be joy to assemble and play with. Avoid tedious assembly and boring, pointless combinations of your modules.

Make it variable: Remember the distinction between ingredients and modules (see top of page). Your modules should prioritize structure over decoration and offer many, many possible configurations. Imagine a "library" of parts that can be combined to create many results, the more pieces you have, the more possible configurations there are (though your pieces may all be identical).



Discover: Toy design research

This assignment will ask you to explore and explain some aspects the existing market for toys. To do this, first research toys on the Internet and in person at stores. You will create a presentation of your findings to help others understand how modular kits work.

Presentation

Requirements

You will produce a presentation with the following elements:

1. Title Page
 - i. Toy Research
 - ii. By: YOUR NAME
 - iii. Date
2. Definition
 - i. What exactly are toys and what are they for?
3. What toy categories did you find? You can identify your own categories. Please include at least four categories.
 - i. Category name (you can invent this if there isn't a good one)
 - ii. What materials are the toys made from?
 - iii. Who are the intended users?

Include between 6 to 20 slides. Please include images where possible.

Exporting to a PDF format

Tutorials for software applications:

- [Google Slides](#)
- [Microsoft Powerpoint](#)
- [Keynote](#)

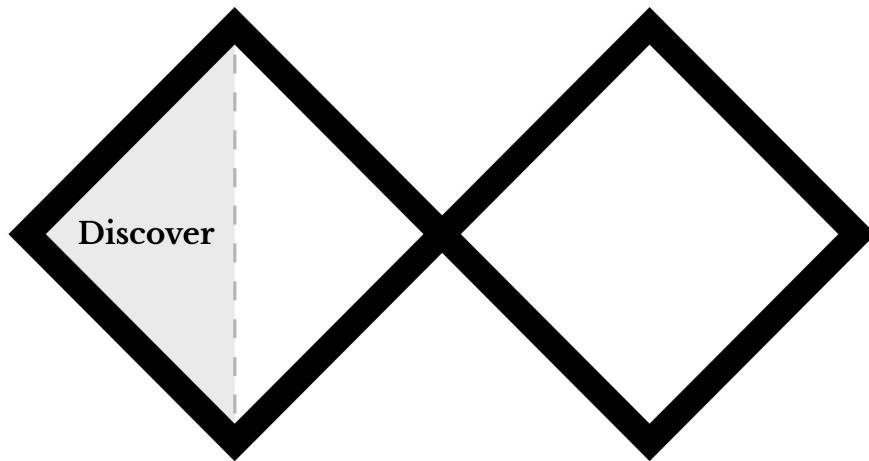
Instructions

1. Conduct desktop and field research of toy kits and models. Investigate websites that sell toys and visit physical toy and hobby stores.
2. Produce the presentation according to the presentation requirements and export it to PDF format.

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload an exported `.pdf` file of the presentation.



Discover: Resources

In this activity, you will be gathering information about the raw materials available to complete the project. Remember, the project brief mentioned that you have a budget between \$0 and \$10. Ideally, someone with limited financial resources should be able to reproduce your design. Please do not use combustable or explosive materials like matches, or materials that would most likely injure someone such as shards of glass or harmful chemicals. Safety first.

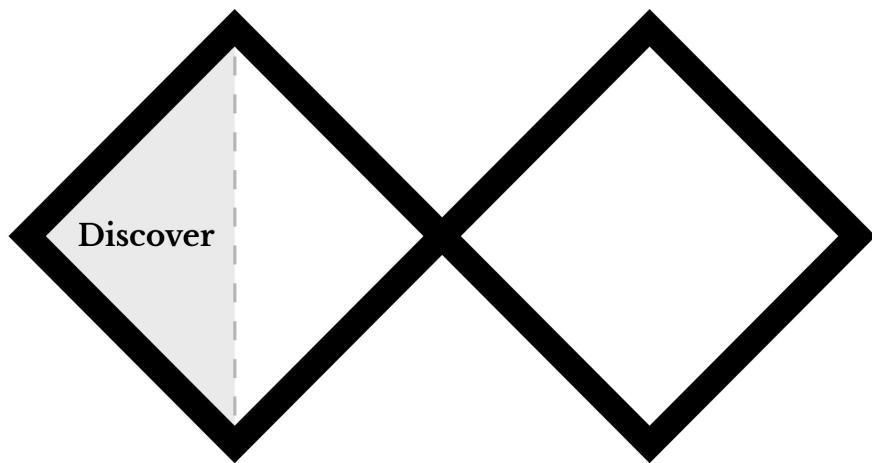
Instructions

1. **Take Stock:** Photograph materials and objects from around your household or that you discard, or commonly acquire for free with other things that you buy. Of these materials, what might be useful?
2. **Local materials:** Go to a supermarket, hardware, craft supply store, or any other store that may have raw materials you can use. Photograph and document potential materials, objects, fasteners. Pay attention to the inexpensive or bulk products.

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload 5 to 10 .jpg or .png photographs of materials. **Do not take screenshots or include images from websites. These materials should be local to you.**



Discover: Modular design research

This assignment asks you to look at objects not as whole "things," but rather as a sum of parts. It also asks you to consider the user experience of the person involved with building a "thing." To do this, explore and explain some aspects **modular design** by investigating why products and objects are designed and constructed the way they are. Areas of investigation could include architecture, engineering, product and furniture (industrial) design, and others.

Find images of interesting or inspiring ways of making, attaching, and combining parts. You will create a presentation of your findings to help others understand how modular systems work.

Presentation

Presentation format template: https://docs.google.com/presentation/d/1cwoQfh5y5k-A6tzx7rjda8tW8RR_XJ2H6k36OIU6nPY/edit?usp=sharing

Requirements

You will produce a presentation with the following elements:

1. Title Page
 - i. Modular Design Research
 - ii. By: YOUR NAME
 - iii. Date
2. Definition
 - i. What is "modular design"?
3. What categories of modular design did you find? You can develop your own categories? Please include at least four categories.
 - i. Category name (you can invent this if there isn't a good one)
 - ii. What are the affordances and benefits of this category?
 - iii. What are the drawbacks and limitations of this system?
 - iv. What materials could be used or substituted from your resources research? Include images from your resources discovery.

Include between 6 to 20 slides. Please include images where possible.

Exporting to a PDF format

Tutorials for software applications:

- [Google Slides](#)
- [Microsoft Powerpoint](#)
- [Keynote](#)

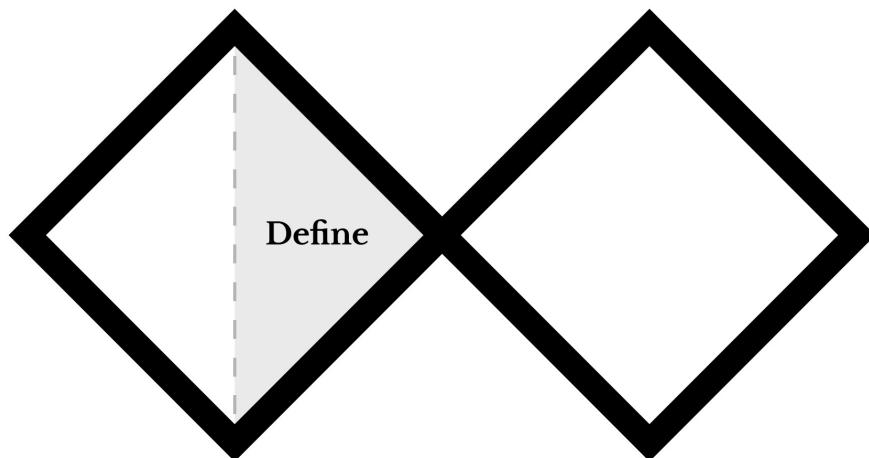
Instructions

1. Conduct desktop and field research of modular design. Investigate websites and physical stores that sell parts for modular objects and systems.
2. Produce the presentation according to the presentation requirements and export it to PDF format.

Post work

Use the exact indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload an exported `.pdf` file of the presentation.



Define: Product pitch

Now is a good time to re-read the project brief. After you reacquaint yourself with the project, choose a product that will form the basis for the project. To do this, you will describe an existing toy product and produce a one-sentence pitch to explain how you might alter or make design changes, particularly if you find aspects of the product problematic ecologically, culturally, etc. You will be building this project yourself and producing instructions for others. It must be feasible for someone without special skills to re-create.

Product pitch document

Create a document file with the following:

1. Your Name
2. Date
3. Title
4. Description of existing toy type:
 - i. Toy name or type (choose one)
 - Human or animal figures
 - Architectural models
 - Machines
 - Structures and shapes
 - Puzzle or game
 - Integrated electronics
 - other
 - ii. Describe the basic function or of the toy.
 - iii. Who is the toy designed for?
 - iv. What does it do? How does it work?
 - v. What materials is it made of?
 - vi. How much does it cost?
5. Design pitch
 - i. I will design a(n) (**toy name**) for (**target user**). The key changes include (**list key changes**).
 - An example pitch might be, "**I will design a finger puppet game for older children. Key changes to finger puppets include a way to allow a child to alter the face of the puppet and the incorporation of game rules that foster**

conversational skills."

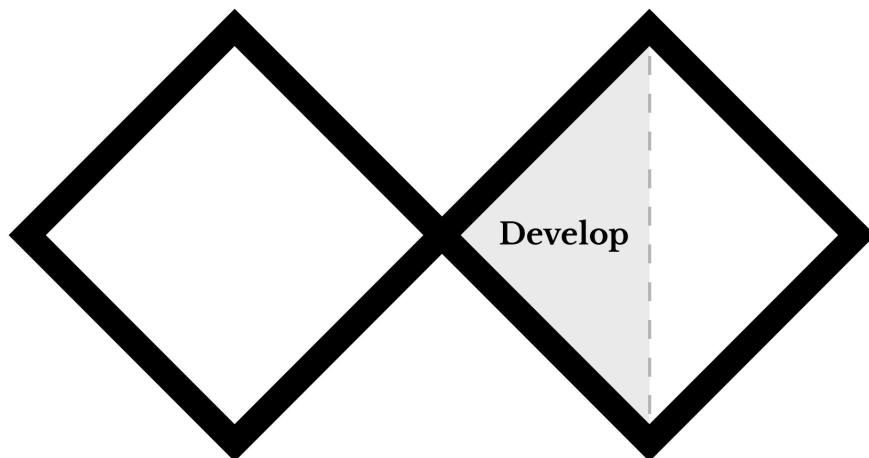
- Note: This pitch will guide the direction for the rest of the project. This is not a speculative project, you will be creating this object and producing instructions for others to follow.
- ii. How will your project use principles of modular design so that your toy can be assembled, disassembled, and reconfigured?

Instructions

1. Choose an existing toy that interests you.
2. Write the description for this toy in the product pitch document using full sentences.
3. Consider how you will change the toy to suit the requirements of the Open Design Project brief. If the existing toy is modular in nature, how will you alter it or use it in novel ways to make it your own? If the existing toy is not modular in nature, what aspects of it can become modular? **Your user should be able to make three different objects from the same set of parts. Write a pitch and include a description of the attributes you will modify.** Examples include:
 - i. Target audience (from child to adult for instance)
 - ii. Materials, fasteners
 - iii. Aesthetics
 - iv. Operation, assembly, use, or purpose
 - v. Added variants or unconventional uses for an existing system.
4. As a vital part of the design process, this document should be well formatted and clearly written. Please do not copy and paste the assignment text into the document.

Post work

1. Export and upload the pitch document in `.pdf` format.



Develop: MVP Prototype

You will now start prototyping with your materials to try to approximate the toy from your product pitch. You will develop an **MVP** or **Minimum Viable Product** to use in later user testing.

Constraints

1. You must not spend more than \$10.00 USD to assemble the kit.
2. Your users must be able to assemble their kits without special skills or tools. Tools are excluded from the cost restriction.
 - i. Allowed tools: Scissors, X-Acto knife
 - ii. Allowed surface marking implements: Pen, pencil, marker, paintbrush

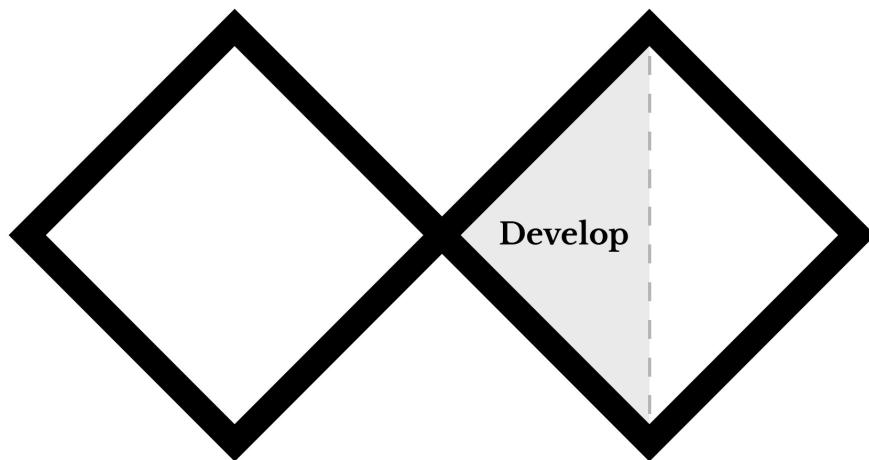
Review the project requirements listed on the [introduction page](#) for this project.

Instructions

1. Revisit your research, resources, and product pitch. Make note in your journal of any ideas, insights, themes, or opportunities that you want to explore.
2. Gather an array of materials to work with.
3. **Start experimenting.** Transform manipulate materials, use objects, and create visual modifications.
 - i. Take photos of your experiments and outcomes as you work. Don't worry if they are rough or ambiguous.
 - ii. Five (5) photos minimum.
4. Once you are happy with what you came up with, start to make variations.
5. You should end up with a kit of parts that you can describe to another person how to make and assemble. Take photos of individual parts, templates, connectors, fasteners, and structural elements.

Post work

1. Upload photos of the prototype(s).



Develop: Instructions

Now you will make a set of instructions to teach another person to create and assemble the toy(s) you have designed.

Note: Remember, none of this is fiction. You are creating a real instruction manual with everything needed for the end user to do this on their own. If you are incorporating templates, they will be printing those templates out from your instructions.

This project asks you to do something that has elements of novelty, to be resourceful, and to produce a modular system of parts. To check that you are on track before submitting, it may help to ask yourself the following questions:

1. Is my project's core idea ambitious enough, or too ambitious?
2. Does it do something that no one else has quite done before in the same way?
3. Does it satisfy the project's reconfigurable modular system and kit of parts requirements?
4. Can the documentation photos be better quality? (I.g - We shouldn't be able to see your living room or kitchen in the background)
5. Is the instructions document properly formatted and readable?

Document requirements

1. Title of your toy design
2. By line with your name
3. Brief description of the toy
4. List any safety hazards and/or if adult supervision is required.
5. Required materials
 - i. Include a cost breakdown
6. Required tools
7. Estimated time to complete the assembly
8. Parts manifest
 - i. List and name each distinct part that will be constructed or used and how many will be needed.
9. Step by step instructions for one object variant.

Instructions

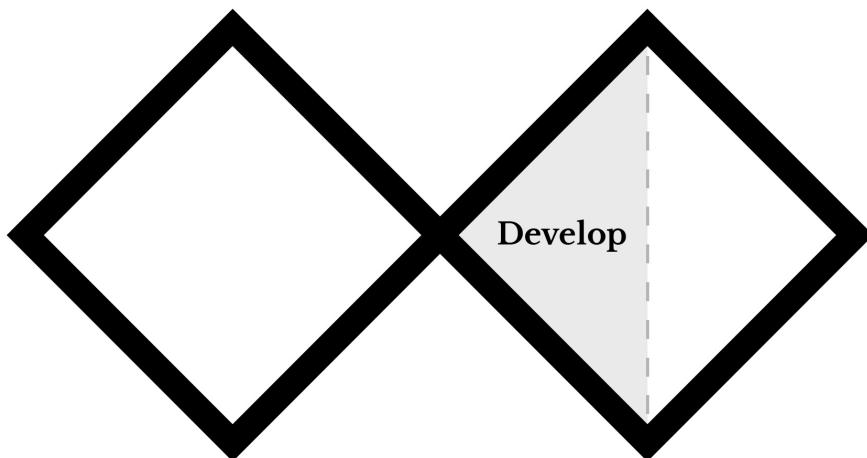
1. If you do not have skills to use professional layout software like Adobe Illustrator or InDesign, use word processing or

presentation software to create the instructions.

- Include photos, drawings, figures, diagrams, templates, and any other visual information that may aid the understanding of the instructions.
2. Export the instructions in `.pdf` format.

Post work

1. Upload the instructions PDF document.



Develop: User testing

Ideally, you will want to get feedback from a user representative of your audience both in terms of who will be constructing with the kit and who will be the end user. For instance, a parent might be the one to put the kit together if the toy is intended for a small child. Alternatively, a child might be assembling the kit for themselves or as a gift for another.

Test session

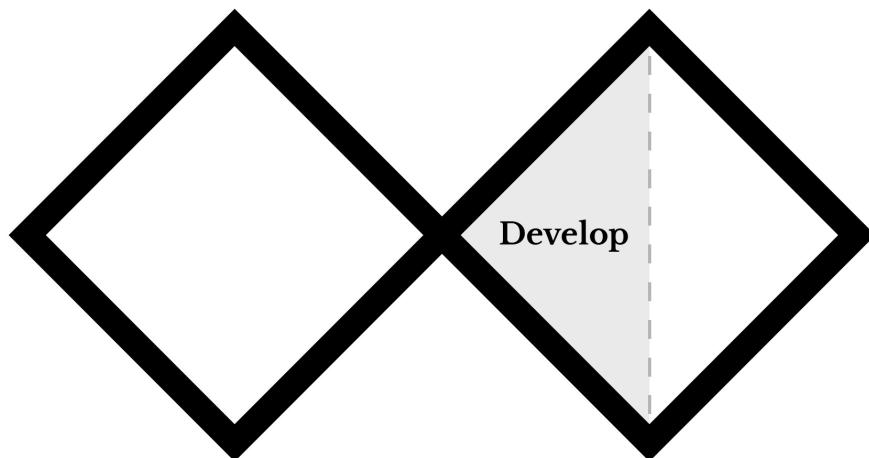
Carefully observe someone attempting to use the kit. Take notes of what you notice. You may need to give some verbal suggestions if your users get stuck, but try to say as little as possible.

1. Print or send your instructions from the prototyping phase.
2. Have a target user try to follow the instructions to build the kit from scratch. That is, do not just have someone interact with the objects that you built, but have the target user actually build the kit itself. If the toy is aimed at young children, the target user might be a parent or older sibling. This can be a friend, family member, or colleague. Ideally, you will be in the room with the participant while they follow your prototype instructions. However, if your participant is remotely located, ask them to set up their webcam or phone camera so that you can see them and their work space. It is best to be available in real time because your user may get stuck. Recording a video is not required, but if you intend to record them, be sure to ask for their permission or their parents permission if it's a child.
3. Write observational notes as they go through the process, and any insights that you discover. It may be helpful to ask your participant to talk through their thought process as they are putting things together. Help your user through any parts of the process that they get stuck on, and make a note of it.
4. Keep track of how long it takes your participant to follow your instructions.
5. After your user finished, ask them some followup questions:
 - What did you like about using the kit?
 - What didn't you like? Why is that?
 - What could be better?
 - What were you feeling while following the instructions?

Post work

Use the indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. After you are done testing submit a typed .doc of your test notes. Be sure to include your name on the document.



Develop: Iterate

Review your notes from the user test and make adjustments, clarifications, and revisions to improve your kit and instructions. Whether your users have given you general feedback or specific feedback, it is your job to interpret what they are telling you. In an ideal product development scenario, there would be plenty of time to perform as many iterations as needed. If time allows, try testing another one or two participants to see if you can further improve the instructions.

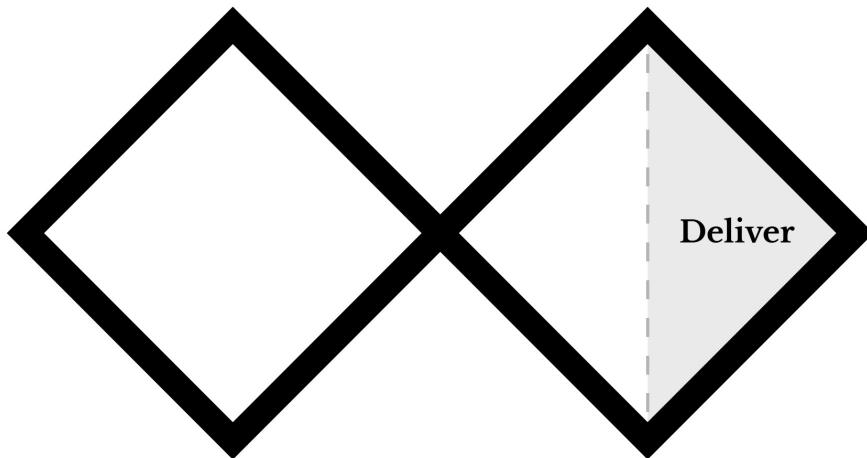
Instructions

1. Make changes and improvements to your kit and instructions based on your feedback in the user test.

Post work

Use the indicated file format. You must obtain prior approval to deviate from these upload requirements.

1. Upload a `changelog.doc` file.
2. Upload a `yourname-instructions-2.pdf` document. This should be a new and revised PDF document. Unrevised documents will not be graded.



Deliver: Project documentation

You will now take photos of the toy assemblies and make any needed adjustments to the instructions document.

Documentation

Photograph documentation

1. Arrange all of the parts, [knolling style](#).
2. Photograph the kit parts from above on a flat, white background.
3. Assemble the kit parts into at least three total object variations.
4. Take photographs of the assembled kit toys demonstrating any modular or reconfigurable characteristics of the kit. If you are feeling ambitious, follow [this video tutorial](#) to set up a light box, or see this [instructables tutorial](#).

Instructions document

1. Add the knolling-style image to the title page of the document. If used as a background, ensure all text is still legible.
2. Add at least one of the other images to the end of the instructions to show the final result.

Post work

1. Submit a total of four to nine (4-9) `JPG` images:
 - i. Submit one (1) knolling style `JPG` image showing the various parts you have assembled for the toy kit.
 - ii. Submit three to eight (3-8) `JPG` images of the object variants.
2. In addition to the images, upload a revised PDF instructions document and name it `yourname-instructions.pdf`.

Self design

In this short lesson, you will complete a Pathway Design Activity to help you start thinking strategically about your future learning and career goals. You will also read and submit a reflection of the final chapter of *Design and Truth* by Robert Grudin.

The Design of Private Knowledge

The Design of Private Knowledge (p.178 - 195) in Design and Truth by Robert Grudin

Prompt

In this chapter, Grudin talks about something he calls mental design, the ability to wrap a story or experience into a narrative for the purpose of understanding the world and healing from a traumatic event. He also posits that subjectivity (bias) is a form of unconscious design. Narratives help us confront bias, assumptions, and preconceptions. Think of a time when you had to confront a bias of your own. Describe the event. Who was involved and what did you learn?

Writing guidelines

1. Length: (150-300 words)
2. Reference the chapter content whenever possible
3. Cite sources where applicable.
4. Check for spelling and grammar.
5. Avoid generalizing language. Choose clear and concise wording.

Creative Mornings: Creativity and the Freedom to Fail

In this creative mornings podcast, the musician Moby reflects on where he grew up, how it influenced his creative process, and the importance of being allowed to fail.

[Creativity and the Freedom to Fail \(50:05\)](#)

How to Become Great at Just About Anything

In this Freakonomics podcast episode, Stephen Dubner explores how anyone can become really good at doing almost anything.

[How to Become Great at Just About Anything \(51:51\)](#)



Pathway design activity

A **pathway** describes a literal or metaphorical route or series of events connecting a current condition to a future condition. In biochemistry, metabolic pathways describe sequences of chemical reactions that occur in living organisms. In physiology, neural pathways describe chains of cells that carry signals connecting one part of the nervous system to another. And in the context of education, a *learning pathway* describes the sequence and range of knowledge a learner acquires over a duration of time. Your learning pathway, often referred to as a "trajectory," is not always controllable, and can branch drastically in different directions as your values shift or constraints and opportunities emerge. With that said, to start down a pathway, it can be helpful to imagine the end-point of a learning pathway and work backwards to generate a strategy.

In this activity, you will respond to a series of questions aimed at helping you identify what you want to learn, and what you want to be really good at doing. This can break into a new career, mastery of a skill or field of inquiry, production of a body of work, or the pursuit of a cause, and more. You will then use your answers to write a document detailing your intent and a timeline of important events.

Part 1: Pathway Questionnaire

[MS Word Document File Download](#)

The following questions are designed to help you think about what you may want or need related to your learning goals. For example, if you know that you would need to have an internship to achieve your goal, you would mention a type of internship and some possible companies: "I will need experience from a 3D animation internship at a large studio similar to Pixar or BlueSky." Ensure that your answers are very specific.

1. Subject area

- What skills do you want to master?; OR what do you want to learn how to do?; OR What is your dream job?

2. Related knowledge

- What related or foundational knowledge do you already have?
- What knowledge will you need to acquire?

- How will you gain this knowledge? (Specific courses, supplemental learning, specific books, etc.)

3. Behavioral patterns

- Can you identify behaviors that propel you along your trajectory?
- Can you identify behaviors that hold you back. (mental attitudes, beliefs, actions, and activities)
- How might you eliminate or alter behaviors that work against your goals?
- What new behaviors might you employ?

4. Resources

- What tools will you need to further your creative practice?
- What steps are you taking to procure these tools?

5. People

- Who encourages and supports your trajectory?
- Is there anyone who holds you back or is negative about your aspirations?
- Can you identify communities of practice locally or virtually?
- In an ideal world, who could you ask for help, motivation, or advice?

6. Events

- What events, conversations, internships, or interactions need to take place? When?
- What physical experiences will help you? (internships, research trips, etc.)

7. Accountability

- What or who will hold you accountable? Will you include a reward or disciplinary system?

Part 2 - Write a Learning Strategy Document

Now that you have completed the questionnaire, use your answers to write a learning strategy document.

1. Write your name and date at the top of the document

2. Statement of Intent

- Rephrase your answer to **Subject Area** as a statement of intent. Example: "I intend to become... I will do this by..."
- Rewrite your other questionnaire responses as a few concise paragraphs to communicate how you will achieve your learning goals.
- The **Statement of Intent** must be a minimum of 300 words and no more than 500 words.

3. Pathway Schedule:

- Include a dated list of the things you will need to acquire or accomplish. Example: "*December 2018: find a list of animation studios to apply to, February 2019: Apply for 3D animation internships*"

Post work

1. Upload the your completed questionnaire from **Part 1** as `questionnaire.doc` to the Canvas assignment:

2. Upload the `learning-strategy.doc` from **Part 2** to the Canvas assignment:

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<!-- Add OERSchema and CC schema vocabulary to object -->
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    <!-- Add OER resource text and media here. -->

    <!-- Link the license and attribution to the page -->
    <link about="#oer-source" property="cc:license" content="https://creativecommons.org/licenses/by/4.0/">
    <meta about="#oer-source" property="cc:attributionUrl" content="https://www.gitbook.com/book/dmd-program/dmd-100-fa18">
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</div>
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