rolling with the punches

DESIGNING FOR AN INHERENTLY CHAOTIC CREATIVE PROCESS

THIS IS THE
BEST IDEA
EVER!!

THIS IS HARDER
THAN I THOUGHT...

THIS IS
FUN!

OK...
WOW...
THAT
FLOPPED.

I LOVE
MAKING
THINGS!

YES! I LEARNED
A NEW SKILL TODAY!

THESIS DOCUMENTATION
PRISCILLA MOK

rolling with the punches

DESIGNING FOR AN INHERENTLY CHAOTIC CREATIVE PROCESS

A thesis submitted to the School of Design, Carnegie Mellon University,
for the degree of Master of Design in Interaction Design.

_____

Priscilla Mok, Master of Design 2013   Date

_____

Stacie Rohrbach, Advisor   Date
Associate Professor, School of Design
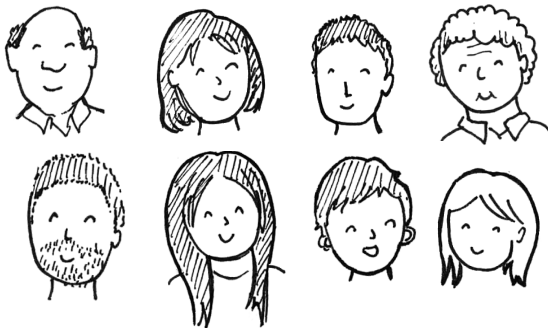Carnegie Mellon University

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

ABSTRACT

How do students and young professionals in different domains currently engage in the creative process? What are some common frustrations people have with their tools and processes, and how are they coping? Combining data from user research, self-reflections, observations from teaching, and drawing on the current literature on creative cognition, this thesis aims to bridge the theoretical findings on creativity with real-world applications, by designing artifacts that will make the creative process useful and accessible to individuals on a day-to-day basis.

PROJECT DEFINITION

The mindmap I created as a way of thinking through my thesis topic.

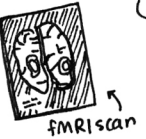# WHY DID YOU STUDY CREATIVITY?

During the course of a thesis project, people will often ask: "Why did you decide to study this topic for your thesis?". Perhaps it's a way of politely trying to find out what it is about the topic that compels you to want to study it for one full year. So to begin, I think it's important to explain briefly the motivation that inspired this project in the first place.

INTRODUCTION

Creativity is a complex, ill-defined concept which researchers have studied using a variety of methods. Most of this research falls into one of two camps:

INDIVIDUALIST APPROACH

→ creativity is studied based on PERSONALITY TRAITS and COGNITIVE PROCESSES

SOCIOCULTURAL APPROACH

→ focuses on ENVIRONMENTAL factors, such as culture, organizational climate, or social dynamics

EXAMPLES:

OK TRY THIS ONE NOW!

Having research participants solve insight problems (like brainteasers)

I am adventurous. I fear rejection.

Taking personality tests measuring traits related to creativity

THE LIVES of ARTISTS

Studying preeminent figures in their respective domains

COMPANY INNOVATION TIME work 20%

Looking at organization-wide policies on how to foster innovation or structure teams

—— HOWEVER... ——

○ Studies often take place in controlled environments using problems that have well-defined solutions already, which is problematic because issues in the real-world that require creativity often aren't so clean and clearly-defined

○ Not sure if these findings relate to people in their day-to-day lives

○ Not always applicable to the individual

THESE METHODS RESULT IN AT LEAST 2 ISSUES HERE:

① DO THESE METHODS **REALLY** ADDRESS "REAL-WORLD CREATIVITY"?
(how individuals generate and execute ideas in a situated, real-world context)

INDIVIDUALIST APPROACHES — try to understand specific mental processes / personality traits

TOO NARROW!

SOCIOCULTURAL APPROACHES — leave out the individual experience in favor of the group / organization

TOO BROAD!

② Many of these findings are currently only accessible via books and journals

CONCEPTUAL Blockbusting

Creativity Research Journal VOL 23. ISSUE 4.

Takes time to read!
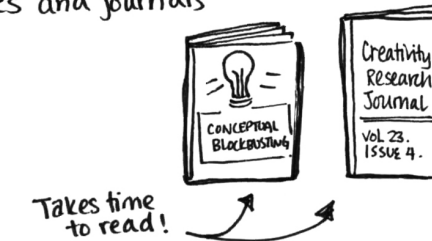
Some interesting problems for DESIGN?

① How to validate or expand on the findings from these two approaches so that they better reflect the experience of an individual going through the creative process.

② How to make the information from these two approaches more useful and accessible.

HOW TO DO IT?

USER RESEARCH METHODS FROM DESIGN

☑ Aims for a **deep** understanding of an individual's experience

How can insights from such an investigation inform the design of a PROCESS or TOOL that helps individuals to facilitate or enhance their creative process?

Not just DESIGNERS but people in different domains too.

GOALS OF THE PROJECT

The goal of my project was to answer the question, "How can the design of a process or tool that is informed by creative cognition, facilitate or enhance how students and young professionals working in a variety of domains develop creative ideas and act on them?". To do this, I first broke down the question into sub-questions that needed to be answered.

What is creative cognition? How can findings from the literature be applied to the design of a process?
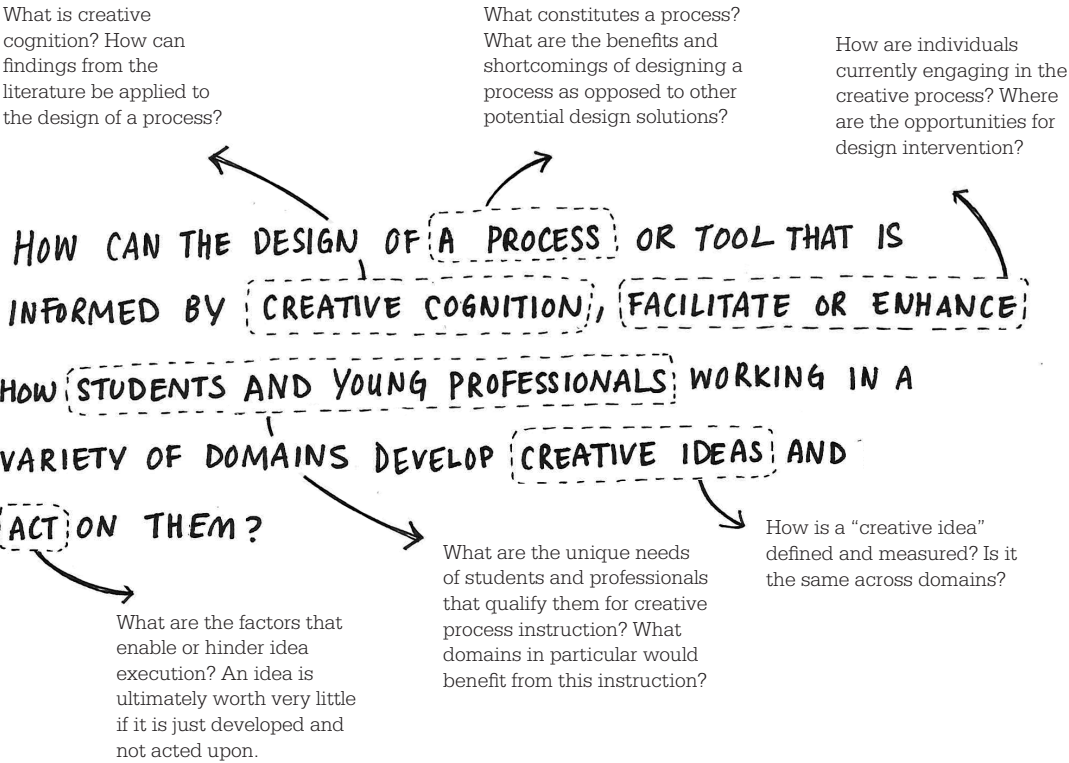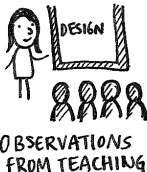
What constitutes a process? What are the benefits and shortcomings of designing a process as opposed to other potential design solutions?

How are individuals currently engaging in the creative process? Where are the opportunities for design intervention?

HOW CAN THE DESIGN OF A PROCESS OR TOOL THAT IS INFORMED BY CREATIVE COGNITION, FACILITATE OR ENHANCE HOW STUDENTS AND YOUNG PROFESSIONALS WORKING IN A VARIETY OF DOMAINS DEVELOP CREATIVE IDEAS AND ACT ON THEM?

What are the factors that enable or hinder idea execution? An idea is ultimately worth very little if it is just developed and not acted upon.

What are the unique needs of students and professionals that qualify them for creative process instruction? What domains in particular would benefit from this instruction?

How is a "creative idea" defined and measured? Is it the same across domains?

ACHIEVING THIS GOAL...

Look at and combine data from:

USER RESEARCH · LITERATURE REVIEW · SELF-REFLECTION · OBSERVATIONS FROM TEACHING · TOOLS AUDIT

MEASURING SUCCESS...

Get qualitative feedback from people and see if it's positive

This is great! I need it.

SCOPE AND LIMITATIONS

Through the investigation of creativity in a situated real-world context, this project aimed to develop a process or tool that supports the work of students and professionals who regularly engage in creative activity and fits into the context of their lives. However, it's also important to keep in mind that due to some key aspects of this project (such as the limited timeframe, the users I have access to, and the research methods at my disposal) the insights and design concepts from this project are necessarily limited in scope.

SCOPE

▶ NOT ONE-SIZE-FITS-ALL
This project is not meant to be a one-size-fits-all solution that will promise the sudden generation of transformative ideas.

LIMITATIONS

CANNOT capture (thoughts) · I get my ideas in the shower usually... · CAN capture

▶ CAN'T CAPTURE THOUGHTS
Creativity is inherently as much a thinking activity as it is externalizing one's ideas to the world. Therefore I can only study some aspects of creativity to the extent that it can be verbalized or observed.

have access to
Formal Education · Mentors · Tools

▶ JUST STUDENTS + YOUNG PROFESSIONALS
The final design concepts may be more applicable to just students and young professionals. This group also has access to things that a broader range of individuals don't, like mentors, tools, and formal education

SIGNIFICANCE

This project has the potential to significantly impact the field of design and society at large, but in slightly different ways. For the field of design, this project aids the communication and teaching of the creative and design process, while for society, this project will help people find new ways of investigating solutions to economic and social problems in our society today.

FOR THE FIELD OF DESIGN:
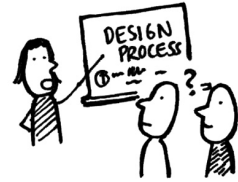
→ Many analogs between design process and creative process, so it should help in teaching the design process.

E.g. Brainstorming concepts in design is like Idea Generation in the creative process.

→ May help designers better communicate their thought and work process

E.g. A designer can explain why it's good not to just choose the first idea that comes up

" Yet despite the acknowledged importance of this [synthesis] phase of the design process, synthesis appears magical when encountered in professional practice. THE IDEA OF DESIGNERS AS MAGICIANS is an intriguing metaphor, because their work is mysterious and the output can be phenomenal and tremendously emotional. "

— JON KOLKO
EXPOSING THE MAGIC OF DESIGN [9]

FOR SOCIETY:
It's important to understand how the creative process works in order to tackle the issues that contemporary society faces.

CHRIS PACIONE

4 conditions characteristic of society today that make it important to understand how the creative process works:
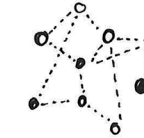
① CONDITION OF PLENTY
Consumers are saturated with choice, so traditional differentiators like cost, reliability and features are no longer enough to keep a business relevant.
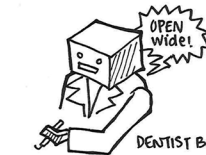
② CONDITION OF COMPLEXITY
Ubiquitous computing is here. Everything is social. Complexity needs to be tamed!

③ CONDITION OF AUTOMATION
If a task can be defined as a series of explicit steps and repeatable loops, it's likely in the future there will be an electrical or chemical solution that can do it more effectively.

④ CONDITION OF DECAY
Things tend towards disorder. A lot of things are broken or about to break. For example: education, government, health care.

OPEN WIDE!
DENTIST BOTS

EDUCATION SYSTEM

Daniel H. Pink also echoes these ideas in his book, where he talks about the "creative economy". He also adds that businesses should focus more on CREATIVE ASSETS like:

DESIGN   STORYTELLING   EMPATHY

PLAY   TEAMWORK
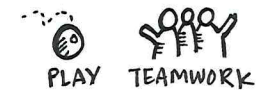
...as a complement to things that are prized in our "knowledge economy" such as information and expertise. [11]

⇨ These conditions result in economic and social issues (such as the replacement of jobs with robots or the broken health care system) that are becoming increasingly difficult to solve without innovation and creativity. To move society forward and solve these problems, we need to understand how the creative process works.

RESEARCH TIMELINE

After thinking of some initial research phases and activities I needed to conduct, I created a proposed timeline for this project. However, I also included a timeline here of how events actually unfolded, for comparison:

| SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY |

PREVIOUS SEMESTER & SUMMER
Background research, IRB application
Conduct preliminary interviews

MIDWAY POSTER REVIEW

FINAL POSTER REVIEW

FINISH!

EXPECTED

| EXPLORATORY RESEARCH | GENERATIVE RESEARCH | CONCEPTING + IDEATION | PROTOTYPE SOLUTIONS | EVALUATE SOLUTIONS + REFINE | WRITE THESIS |

REALITY

| READ LITERATURE | EXPLORATORY RESEARCH | ANALYZE + SYNTHESIZE | CONCEPTING + IDEATION + POSTER PREP | HOLIDAY | WRITE LIT REVIEW | GENERATIVE RESEARCH | ANALYZE + SYNTHESIZE | PROTOTYPE CONCEPTS + EVALUATE | SKETCHNOTE THESIS |

LESSONS LEARNED...

- Factor in lots of time to analyze + synthesize data. Important to have time to let it "sink in"
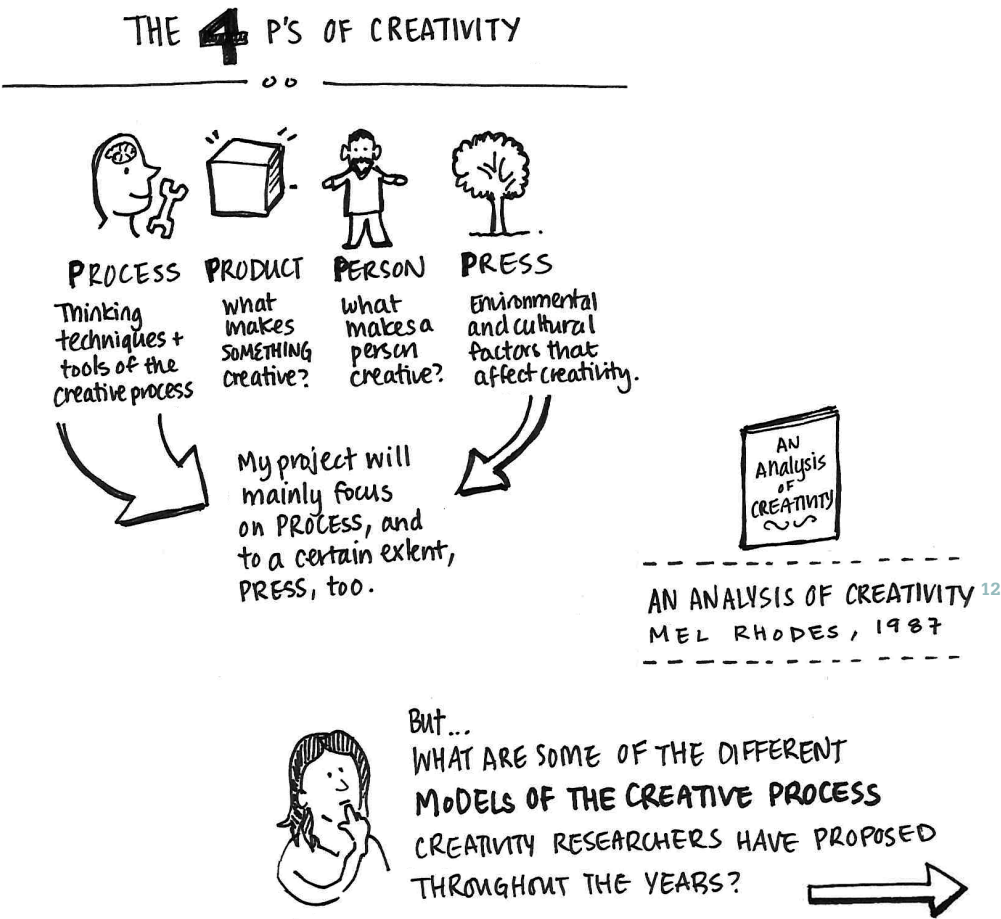- Factor in time for preparing posters for review sessions

EXPLORATORY RESEARCH

BACKGROUND

I examined a broad range of work—from scholarly articles to books geared towards the general populace—to gain a better understanding of the current state of creativity research. The following is a review of a selected number of these works, as well as their design implications for the project. The works are organized around three contextual frames: creative processes, creative cognition, and creativity strategies.
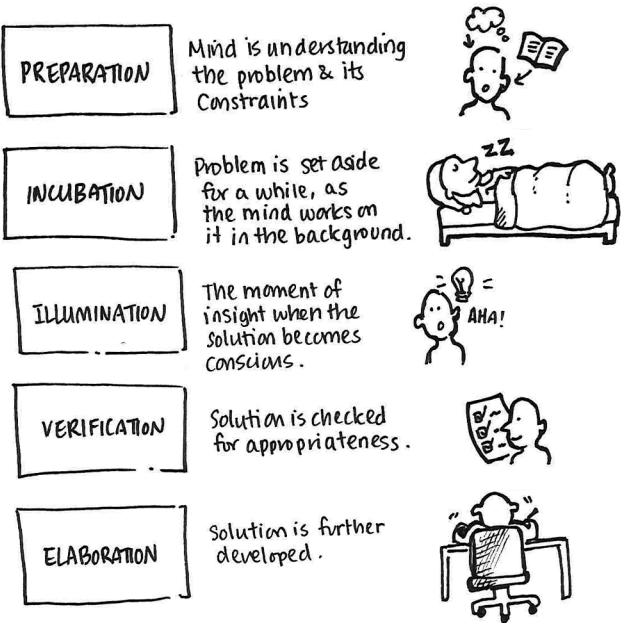
CREATIVE PROCESSES

Educational researcher Mel Rhodes proposed in 1987 a classification system for thinking about various aspects of creativity called:

THE 4 P'S OF CREATIVITY

PROCESS
Thinking techniques + tools of the creative process

PRODUCT
what makes SOMETHING creative?

PERSON
what makes a person creative?

PRESS
Environmental and cultural factors that affect creativity.

My project will mainly focus on PROCESS, and to a certain extent, PRESS, too.

AN Analysis OF CREATIVITY

AN ANALYSIS OF CREATIVITY [12]
MEL RHODES, 1987

But...
WHAT ARE SOME OF THE DIFFERENT MODELS OF THE CREATIVE PROCESS CREATIVITY RESEARCHERS HAVE PROPOSED THROUGHOUT THE YEARS?

THE ART OF THOUGHT
GRAHAM WALLAS, 1926 [16]

Wallas proposed one of the earliest models of creativity. It consisted of 5 stages:

Stage	Description
PREPARATION	Mind is understanding the problem & its constraints
INCUBATION	Problem is set aside for a while, as the mind works on it in the background.
ILLUMINATION	The moment of insight when the solution becomes conscious.
VERIFICATION	Solution is checked for appropriateness.
ELABORATION	Solution is further developed.

This model lays the foundation for models produced by other creativity researchers.

—whew!
MIHALY CSIKSZENTMIHALYI describes the creative process in the same way but adds: [4]

* THIS CLASSICAL ANALYTIC FRAMEWORK LEADING FROM PREPARATION TO ELABORATION GIVES A *SEVERELY DISTORTED* PICTURE OF THE CREATIVE PROCESS IF IT IS TAKEN TOO LITERALLY. [ELABORATION] IS PUNCTUATED BY **small epiphanies** ... THE PROCESS IS LESS LINEAR THAN RECURSIVE ..."

R. KEITH SAWYER, author of EXPLAINING CREATIVITY [14] adds that since the creative process can vary from person to person or project-to-project, some creativity researchers prefer to refer to them as "HABITS OF THE MIND" or "DISCIPLINES".

The point is, even though creative process models might be described as CLEAN and LINEAR, it's probably not the way it actually manifests in the real world.

LESS LIKE THIS...   MORE LIKE THIS?

over the years, creativity researchers and working professionals have produced numerous models of the creative process. It's hard to review them ALL but a few I looked at are :

EXPLAINING CREATIVITY [14]
R. KEITH SAWYER, 2012

For R. Keith Sawyer (creativity researcher at Washington University in St. Louis) his model was developed by integrating aspects and stages from other researchers' models :

① FINDING + FORMULATING THE PROBLEM

② ACQUIRING KNOWLEDGE RELEVANT TO THE PROBLEM

③ GATHERING POTENTIALLY RELATED INFORMATION

④ TAKING TIME OFF FOR INCUBATION

⑤ GENERATING A LARGE VARIETY OF IDEAS

⑥ COMBINING IDEAS IN UNEXPECTED WAYS

⑦ SELECT THE BEST IDEAS, APPLYING RELEVANT CRITERIA

⑧ EXTERNALIZE THE IDEA USING MATERIALS AND REPRESENTATIONS

Difference BETWEEN ② & ③ ?

Acquiring knowledge here means acquiring domain-specific knowledge (e.g. studying medicine) while Gathering information involves more conducting research and getting information specifically for the problem

sawyer emphasizes that :
• these stages may/may not happen nonlinearly
• a project will probably have several mini-insights rather than one BIG insight
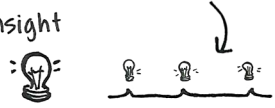
For Harvard psychologist Shelley Carson, her model is similar to Wallas' model except with an additional IMPLEMENTATION stage where one is trying to bring the idea to a wider audience. [3]

IMPLEMENTATION → KICKSTARTER

SHELLEY CARSON
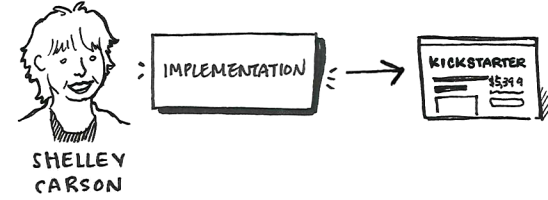
⇒ IMPLICATIONS FOR DESIGN

• Most models of creativity closely model the original model proposed by Wallas in 1926, though some researchers have expanded or elaborated on some stages

• Many researchers stress that the process likely unfolds in a nonlinear fashion

• For this project, these models are a good starting point for understanding, mapping, and potentially interpreting my findings from user research

CREATIVE COGNITION

Another area I wanted to look at for this project was creative cognition, partially because of my background in neuroscience and also to gain a more thorough understanding of the different stages of the creative process.
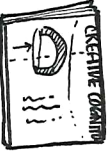
Me, in a past life

WHAT'S ⇒ CREATIVE COGNITION { THE ABILITY TO BE CREATIVE DOESN'T REQUIRE SOME SPECIAL BRAIN FUNCTIONS, BUT RATHER USES QUITE NORMAL MENTAL PROCESSES EVERYONE HAS

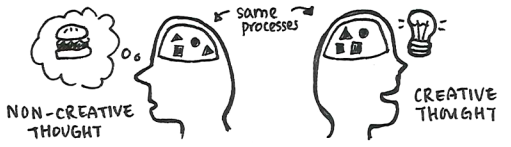Everyone can be creative! has the potential to

One of the first works I looked at was :

CREATIVE COGNITION [6]
RONALD A. FINKE, THOMAS B. WARD, & STEVEN M. SMITH, 1996

CREATIVE THOUGHT is a function of normal human thought processes, and we can study these processes ...

NON-CREATIVE THOUGHT   same processes   CREATIVE THOUGHT

ONE ARGUMENT ?
Look at Language.

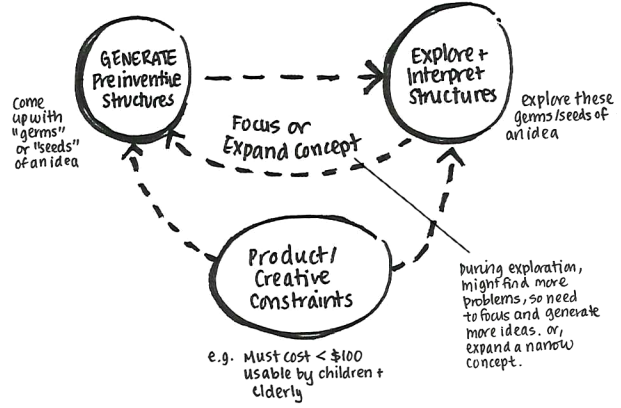CRAZY BANANAS NEVER LOOKED AT KITES SO ENDEARINGLY BEFORE!

We construct novel utterances ALL the time. Though they may not be considered "creative" by others, they are original (at least sometimes).

They also present their general framework for creative cognition, called the

GENEPLORE MODEL
GENErative phase   exPLORE phase

GENERATE Preinventive structures

Explore + Interpret structures

explore these germs/seeds of an idea

Come up with "germs" or "seeds" of an idea

Focus or Expand Concept

Product/ Creative Constraints

e.g. Must cost < $100 Usable by children + elderly

During exploration, might find more problems, so need to focus and generate more ideas, or, expand a narrow concept
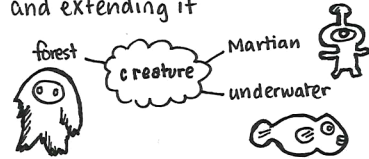
They also provide an overview of the cognitive psychology-based research conducted in creative cognition so far, going in-depth and looking at some of the mental processes involved in Idea Generation.
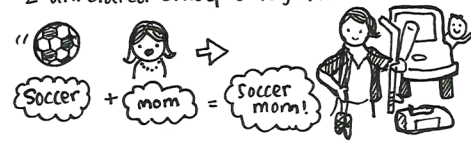
A FEW MENTAL PROCESSES IN IDEA GENERATION

CONCEPTUAL EXPANSION
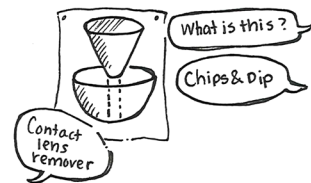e.g. Taking the concept of "creature" and extending it

forest — creature — Martian / underwater

CONCEPTUAL COMBINATION
e.g. Looking at what is the emergent concept when you combine 2 unrelated concepts together

"Soccer + mom = Soccer mom!"

CREATIVE IMAGERY
e.g. Envisioning and interpreting what something could BE

What is this? Chips & Dip / Contact lens remover

➡ **IMPLICATIONS FOR DESIGN**
- studies a bit in-depth for this project, in that they go into detail about some very specific mental processes
- one BIG takeaway: creativity is a universal capacity based off of the same underlying mental hardware we already possess
- there're still lots of creative cognition debates that continue today, because the process itself is so complex

But, how does creative cognition play a role throughout the creative process?
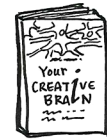
YOUR CREATIVE BRAIN [3]
SHELLEY CARSON, 2012

Carson believed that the main difference between highly creative people and, well, just people is not in neuroanatomical differences, but in how we -activate- and switch ↺ between different brain activation patterns.

Einstein / Me / Picasso
No difference between brains! (except maybe Einstein's)

"BRAINSETS"
↑
Carson's term for these brain activation patterns

A 2010 study by Darya Zabelina and Michael Robinson also support this idea that creative people demonstrate more COGNITIVE FLEXIBILITY. [17]

THE stroop TASK
green blue red black
TASK A: Say the word → Creative people in the study were better at switching between the tasks
TASK B: Say the COLOR the word is written in

She came up with several brainsets important to creativity...

The **7** brainsets that make up her **CREATES** model include:
↳ her framework's name

CONNECT Brainset
- seeing connections between disparate ideas

REASON Brainset
- involves planning, making decisions, and logical problem solving

ENVISION Brainset
- involves thinking visually and imagining "what if" scenarios

ABSORB Brainset
- which involves opening up one's mind to new information

TRANSFORM Brainset
- which involves turning one's negative feelings (e.g. disappointment) into creative works

EVALUATE Brainset
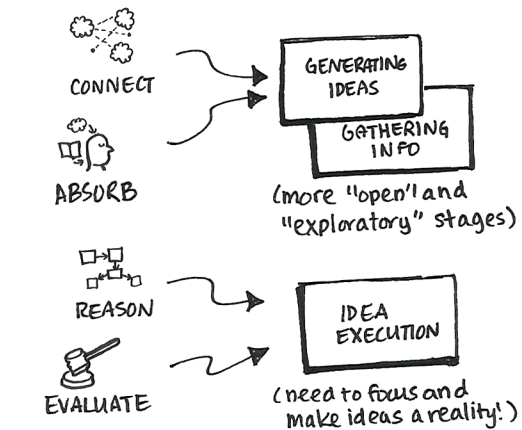- which involves judging whether an idea will be useful and appropriate to take forward

STREAM Brainset
- which involves when one's thoughts and actions come together harmoniously, such as the feeling of being "in the zone"

How do these brainsets apply to the creative process?
She talks near the end of her book about how these brainsets apply to the creative process.

CONNECT → GENERATING IDEAS
ABSORB → GATHERING INFO
(more "open"/and "exploratory" stages)

REASON → IDEA EXECUTION
EVALUATE
(need to focus and make ideas a reality!)

➡ **IMPLICATIONS FOR DESIGN**
- Carson's CREATES model is an approachable way of thinking about mental processes are involved in the creative process
- If being creative truly does involve switching between "brainsets", there's an opportunity to design things that support a variety of these mental processes (e.g. a tool that supports idea evaluation & facilitates working "in the zone" [stream brainset]).

Related to cognition is the role of affect (a.k.a emotions) on the creative process.
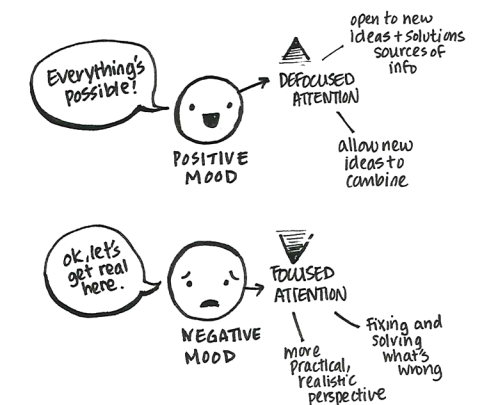
JAMES L. ADAMS (Author of Conceptual Blockbusting) [1] Says:

"EMOTIONS LEAD, NOT FOLLOW."

(in terms of how the brain determines what actions to take)

Interestingly, Carson also touches on the role of emotions/affect in the creative process: [3]

Everything's possible! → DEFOCUSED ATTENTION
POSITIVE MOOD
open to new ideas + solutions sources of info
allow new ideas to combine

ok, let's get real here. → FOCUSED ATTENTION
NEGATIVE MOOD
more practical, realistic perspective
fixing and solving what's wrong

Actually...
EMOTIONS vs AFFECT in PSYCHOLOGY
what's the difference?

AFFECT
more nonspecific and pervasive feeling states (kind of like mood)

EMOTION
more interruptive and acute one-off feeling states (angry, surprised, joy, etc.)

There are also various other studies that support the relationship between emotion/affect and creativity.

A 2007 study by Jennifer George and Jing Zhou found that with employees in a workplace, creativity increased when both POSITIVE AND NEGATIVE MOODS WERE HIGH. [18]

Teresa M. Amabile, a researcher at Harvard Business School, found that there was a simple linear relationship between positive affect and creativity in organizations. [2]

TERESA AMABILE

A good overview of the literature is in the book (unsurprisingly named):

AFFECT & CREATIVITY [13]
SANDRA W. RUSS, 1993
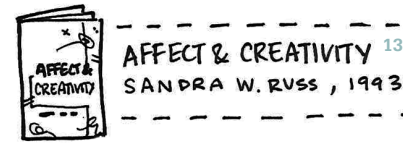
Russ presents a framework that shows the relationship between affective processes, creative cognitive processes, and personality traits. More importantly, she shows how affective processes play a role in Wallas' model.

FOR EXAMPLE:

That's a horrible idea but I'll write it anyways...

An individual open to thinking up "affect-laden thoughts" that might provoke strong emotions will be better at brainstorming because their thoughts are not constrained

WALLAS' MODEL

PREPARATION
INCUBATION
ILLUMINATION
VERIFICATION
ELABORATION

AFFECTIVE PROCESSES

AFFECTIVE PLEASURE IN CHALLENGE
excitement and tension from finding and working on a problem

BEING OK WITH INTENSE AFFECTIVE THOUGHTS & ANXIETY

AFFECTIVE PLEASURE IN SOLVING A PROBLEM

ABILITY TO CONTROL AFFECT

IMPLICATIONS FOR DESIGN
- Affect and emotion have been shown to play a role in the creative process, so it's good to keep them in mind when creating design concepts
- Russ mentions that her framework needs to be verified in the real-world, and design can help do this
- Looking at the role of negative affect is an area she said that also needs research

---

CREATIVE STRATEGIES

I also looked at the literature on what I call "creative strategies", which are strategies an individual, group, or organization can undertake to be more creative.

... BUT IS IT EVEN POSSIBLE TO BOOST SOMEONE'S CREATIVITY?

R.S. Nickerson provides a few good points in his book chapter:

ENHANCING CREATIVITY [15] in HANDBOOK OF CREATIVITY R.S. NICKERSON, 1998

He first reviews 2 areas of literature:

TRAITS COMPETENCIES ATTITUDES OF CREATIVITY (SELF-CONFIDENCE, MOTIVATION, CURIOSITY, KNOWLEDGE)

INSTRUCTIONAL PROGRAMS CLASSES TEACHING CREATIVITY SKILLS

THE VERDICT?
He concludes that it's hard to tell if programs and classes are effective or not, so it's worthwhile to continue research into it.

HOWEVER... Nickerson believes that in the end what truly makes a difference for an individual with reasonable intelligence and potential is... DRIVE. MOTIVATION. COMMITMENT.

IMPLICATIONS FOR DESIGN
- There's an opportunity to support the factors mentioned above, such as "encouraging confidence and willingness to take risks" and "promoting supportable beliefs about creativity" (you can be creative, in addition to cognitive strategies.

Another opportunity I see is to make strategies that help people overcome stumbling blocks in the creative process more accessible and actionable.
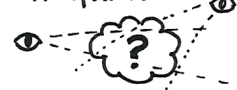
CONCEPTUAL BLOCKBUSTING [1] JAMES L. ADAMS, 2001

Adams talks about different types of blocks that impede our ability to "conceptualize" a problem and solve it creatively.

4 CATEGORIES of BLOCKS

1. PERCEPTUAL BLOCKS
- prevent us from perceiving the information needed to solve the problem
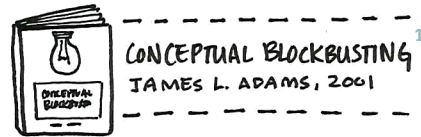 - e.g. seeing a problem from various viewpoints

2. EMOTIONAL BLOCKS
- stem from such as taking risks, failing, feeling lost/chaotic, or being judged by others

WOW that's bad.

Another opportunity I see is to make strategies **MORE ACCESSIBLE AND ACTIONABLE** to help people overcome stumbling blocks in the creative process.

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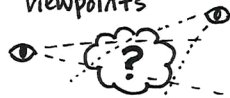
3. CULTURAL / ENVIRONMENTAL BLOCKS
• Are a result of the sociocultural environment we are in (e.g. taboos / cultural beliefs / distractions)

peeing in public — eating with left hand

4. INTELLECTUAL/EXPRESSIVE BLOCKS
• involve not using the right mental strategies or not being able to record/express the idea properly
  e.g. using a diagram to solve a math problem

Adams goes on to discuss various types of **BLOCKBUSTERS**

A QUESTIONING ATTITUDE
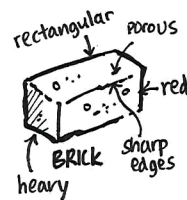We ask less questions as adults because we are afraid of exposing lack of knowledge

THINK MORE FLUENTLY AND FLEXIBLY
lists are a good way to expand one's ability to conceptualize of lots of different ideas

not just for groceries Santa!

WORKING ON THE RIGHT PROBLEM
We tend to work on problems that we're comfortable with or are the most apparent; sometimes we have to find the root high-impact problems

POOR POSTURE
WORK ERGONOMICS
BACKACHE
Take painkillers

rectangular — porous — red
BRICK — heavy — sharp edges

THINK ABOUT THINGS IN TERMS OF THEIR ATTRIBUTES
to break out of a mental rut and see things in a new light

⇨ **IMPLICATIONS FOR DESIGN**
• help people gain a better sense of their own process, so they can be aware of what types of blocks they are struggling with
• design concept could encourage people to try out modifications or improvements to their process (maybe with some "blockbusters")

Although not specifically about the creative process, Art Markman's book provides strategies on "how to solve problems and innovate".

smart thinking
SMART THINKING [10]
ART MARKMAN, 2012

"What's `smart thinking`"

Requires developing smart habits to acquire high-quality knowledge and applying that knowledge to reach goals

HOW TO DO THIS?

① **DEVELOP SMART HABITS**
Habits can be useful or detrimental to our productivity and thinking. We get rid of bad habits by removing triggers and replacing it with another action.

② **ACQUIRE HIGH-QUALITY KNOWLEDGE**
We only remember a small portion of what we experience, so we need to be proactive in influencing how we remember information.
  e.g. We can only pay attention to 3 things at a time and recall about 3 things for an experience. So for a meeting...

PREPARE — PAY ATTENTION — REVIEW

③ **USE HIGH-QUALITY KNOWLEDGE WHEN NEEDED.**
To do this, we need to be able to bring up knowledge when we need it. Making mental connections and identifying the same problem in other situations
  e.g. Describe a problem in its essence, deemphasize objects in the problem

Redesigning a vacuum, are you trying to make a better vacuum or a different way of separating dirt and air?

DYSON VACUUM
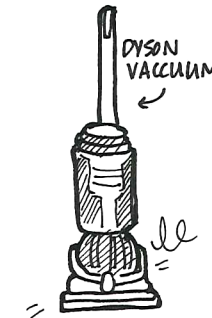
⇨ **IMPLICATIONS FOR DESIGN**
• my design concept can support people in acquiring the high-quality knowledge Markman talks about, or in the creation of smart habits
• help people become more aware of the problems they've worked on before will help apply their knowledge

Carson's book also offers a variety of exercises to practice invoking each of the "brainsets" in her CREATES model. Some examples of exercises: [3]

ABSORB Brainset (being open to new information in the environment or in our minds)
↳ Notice new things
↳ Trying new food

ENVISION Brainset (involves mental imagery and imagining "what if" scenarios)
↳ Imagine the floor plans for your house
↳ Imagining a mental holiday spot

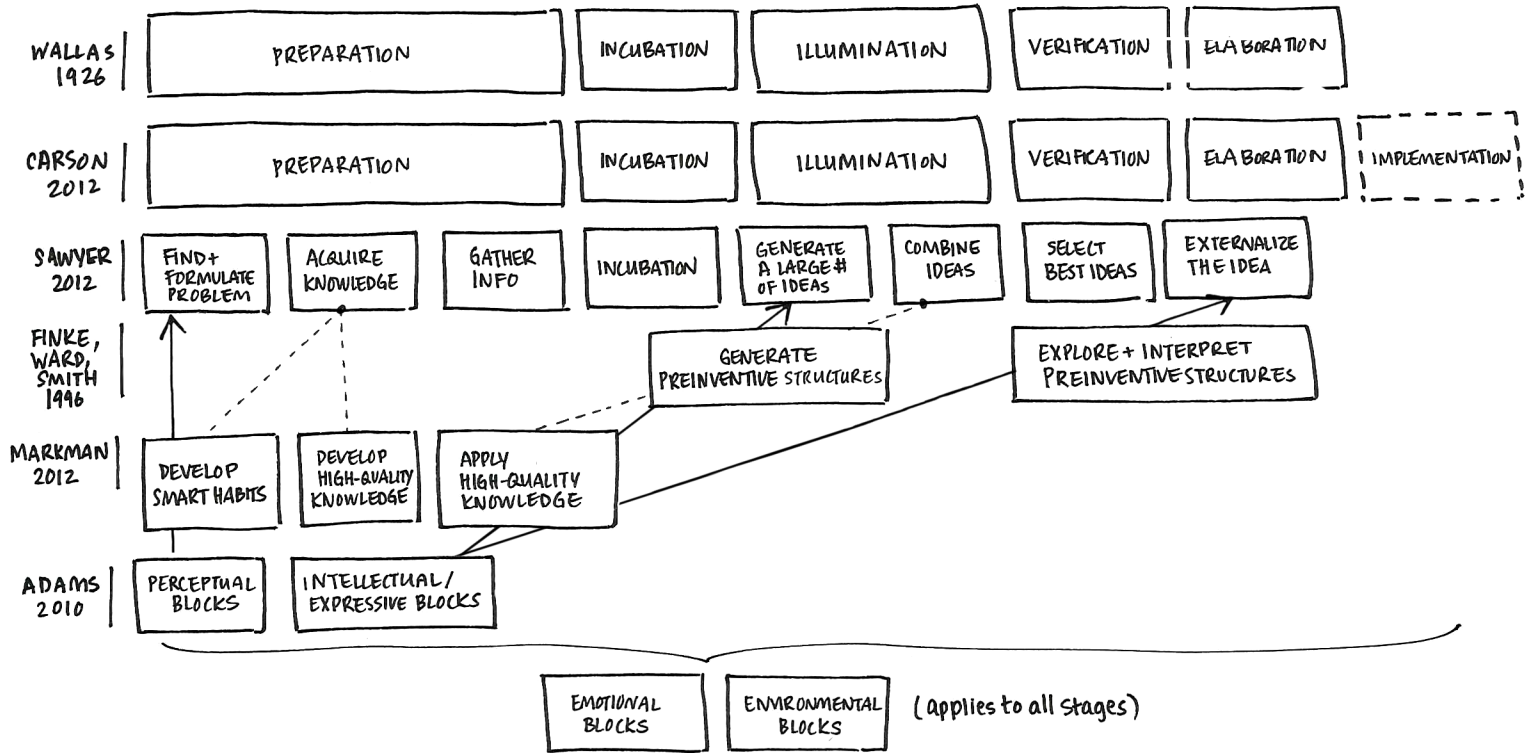**CONNECT** Brainset (making connections between disparate ideas)
↳ Word association
  tension — bounce
  SPRING — leaf
  walk — fall
  seasons
↳ Alternate uses for
  MINI RAKE
  IRON
  SOURCE
  WEIGHT
  HAMMER

{ A FEW CONNECTIONS / OVERLAPS between THE LITERATURE } Here is a chart showing some relationships and overlaps between the literature I just reviewed:

WALLAS 1926: PREPARATION | INCUBATION | ILLUMINATION | VERIFICATION | ELABORATION

CARSON 2012: PREPARATION | INCUBATION | ILLUMINATION | VERIFICATION | ELABORATION | IMPLEMENTATION

SAWYER 2012: FIND + FORMULATE PROBLEM | ACQUIRE KNOWLEDGE | GATHER INFO | INCUBATION | GENERATE A LARGE # OF IDEAS | COMBINE IDEAS | SELECT BEST IDEAS | EXTERNALIZE THE IDEA

FINKE, WARD, SMITH 1996: GENERATE PREINVENTIVE STRUCTURES | EXPLORE + INTERPRET PREINVENTIVE STRUCTURES

MARKMAN 2012: DEVELOP SMART HABITS | DEVELOP HIGH-QUALITY KNOWLEDGE | APPLY HIGH-QUALITY KNOWLEDGE

ADAMS 2010: PERCEPTUAL BLOCKS | INTELLECTUAL / EXPRESSIVE BLOCKS | EMOTIONAL BLOCKS | ENVIRONMENTAL BLOCKS (applies to all stages)

WHAT DOES IT ALL MEAN?

- There are many aspects of creativity, and even at an individual level the design concept could potentially address cognitive, conative (drive/motivation) or affective parts of an individual's experience

- Many books and studies here have offered good recommendation on how to be more creative; however, my design concept could potentially make this information more accessible and actionable, particularly in terms of helping people overcome their stumbling blocks

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TOOLS AUDIT

Since my final design concept may be a process or tool that aids people in their creative process, it was also important to understand the tools that currently reside in this space, and to know what types of experience their design affords, their limitations, as well as opportunities for improvements.

Some of the creativity support tools I looked at included... (not an exhaustive list!)

BOOKS ON CREATIVITY
e.g. Thinkertoys by Michael Michalko
- ☑ Easy-to-use, just read! Easy to flip through
- ☒ Takes time to read and apply the strategies
- ⓘ There's an opportunity to make the content more practical / accessible

WORKSHOPS ON CREATIVITY
e.g. The Creativity Workshop
- ☑ More focus on applicable and actionable strategies
- ☒ Cost money and are usually one-off events
- ⓘ Opportunity to provide the same amount of guidance in an ongoing format

COLLABORATION / PROJECT MANAGEMENT TOOLS
e.g. Basecamp
- ☑ Affords team consensus, and documentation of process
- ☒ Binds you to the workflow of the application. A bit of a learning curve
- ⓘ Opportunity to help people work together using their own workflow

METHOD CARDS
e.g. IDEO Method Cards
- ☑ Portable, easy to flip through pick a method. Mini chunks of info easy to digest.
- ☒ Can be difficult to figure out how to use them together. May sometimes lack real-world examples.
- ⓘ Opportunity to present the chunked-out guidance of method cards in a way that shows how all the chunks might fit together

COMMUNICATION TOOLS

- ⊘ Helps people work together, be on the same page and give each other feedback
- *e.g. skype, email*
- ⊗ Not very conducive for documenting process
- ⓘ Opportunity to create a Communication tool that helps people see how their project Progressed

COMMUNITIES FOR SHARING / PUBLISHING

e.g. Wordpress

- ⊘ Help people receive feedback and view what other people in the same domain have done. Can find examples from search/ tag functions.
- ⊗ can be hard to learn to use initially, may be hard to find sift through all the options to find good examples of work
- ⓘ There's an opportunity to help people share and publish their creative work in a more useful and targeted way.

SPECIALIZED APPLICATIONS / EQUIPMENT

e.g. Photoshop, Compound Microscope

- ⊘ Designed to help execute on very specific tasks, or for specific workflows
- ⊗ Some have a steep learning curve
- ⓘ There's an opportunity to help easier for people to master these tools

NOTEBOOK / SKETCHBOOK

e.g. personal sketchbook

- ⊘ very easy to use and can quickly capture thoughts. Free-format conforms to different workflows.
- ⊗ Not as dynamic as a medium. Hard to share with others. Doesn't provide any guidance or feedback.
- ⓘ Opportunity to create something with the flexibility and simplicity of a notebook, but with guidance when it's needed.

CROWDFUNDING PLATFORMS

e.g. Kickstarter

- ⊘ Allow feedback and encouragement from a broader public. Helps with financial aspect of idea execution.
- ⊗ Not too much latitude to radically change an idea after campaign launch. Might be subject to "design by committee".
- ⓘ Opportunity to create something that facilitates the same feedback and encouragement of Kickstarter, perhaps with less groupthink

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CREATIVITY SUPPORT TOOLS: A COMPARISON

Based on my literature review and user research from the Exploratory Research phase, I developed the following criteria to compare these tools against:

	Books on Creativity	Workshops on Creativity	Method Cards	Collaboration Tools/ Project Management Tools	Social Networks (Virtual)	Communication Tools	Specialized Apps/ Equipment	Communities for Sharing/ Publishing	Notebook/ Sketchbook	Kickstarter Crowdfunding Platforms
INTENDED USER SCOPE — Meant for individuals? A team? or a broader community?	individual	individual	individual / community	team	team	team	individual	community	individual	community
TASK-FOCUSED OR PEOPLE-FOCUSED? — Is it focused on getting things done or facilitating interactions?	task	task	task	task / people	people	people	task	task / people	task	task / people
USE IN THE CREATIVE PROCESS? — Is it used more during stages where the idea is being generated or executed?	SUPPORTS THROUGHOUT (AT A META LEVEL)			THROUGH-OUT	THROUGH-OUT	THROUGH-OUT	EXEC	THROUGH-OUT	GEN	EXEC
GUIDANCE — Does it provide help on how to move through the creative process?	◕	◕	◕	◕	◕	○	○	◕	○	◐
EASE OF USE — Is it easy to use?	◕	◕	◐	◕	◐	◐	○	◕	●	◐
EMOTIONAL SUPPORT — Does it provide support for the ups and downs of the creative process?	◐	◐	○	○	●	○	○	◕	○	●

⇨ **IMPLICATIONS FOR DESIGN**
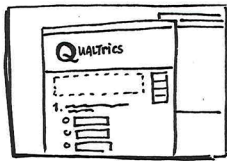
- There's an opportunity in particular to create something that provides emotional support.
- Different creativity support tools have various affordances and limitations, but design opportunities as well, which my design concepts could address. (Some of them, likely not all.)

SURVEYS

I sent out a survey fairly early on in the research process to gather interest and recruit participants for future research activities. But more than that, the goal of the survey was to understand the nature of people's frustrations with the creative process (by seeing what they would change about it, for example), what types of tools and interactions make up their process, and their general attitudes about their own perceived level of creativity.

WHAT: An 18-question survey
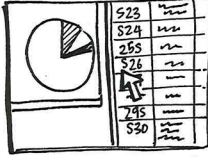
HOW:

1. Create survey using Qualtrics.

2. Send out survey via email and as a Facebook event invite.

3. Analyze results by coding responses or by creating graphs (for quantitative data).

WHO: 87 respondents with 10 pilot respondents

WHEN: Mid-September 2012

HIGHLIGHTS

One of the questions I asked was...

Q: IF YOU HAD A MAGIC WAND THAT WOULD ALLOW YOU TO MAGICALLY IMPROVE ONE ASPECT OF THE WAY YOU CURRENTLY WORK WITH YOUR IDEAS, WHAT WOULD IT DO?

"It would enable me to finish a project from start to finish in a thoughtful and fulfilling manner and not have me peter out at the end and lose interest"

"Exponentially improve my drawing skills"

"Create more hours in the day to work on them"

"Help me grasp the know-how of implementation"

"All of my most creative friends who are all over the world now to be sitting at the same table with me to think of ideas"

"The magic wand would force me to stick to my time schedules better... if I adhered to them I'd be several years in the future, goals-wise!"

"Something that would spontaneously turn my ideas into reality"

"Stop being so afraid to make and iterate... I often agonize and can't get started"

FINDINGS

- Both designers and non-designers felt that they had opportunities to be creative (59% and 40%, strongly agree / agree respectively)

ok.   Try making it creative, too.

BUT! PEOPLE FELT THAT THEY WERE NOT REACHING THEIR CREATIVE POTENTIAL

45% OF PEOPLE IN A NON-DESIGN FIELD FELT THEY WEREN'T REACHING THEIR CREATIVE POTENTIAL

18% OF PEOPLE IN A DESIGN FIELD

WHY COMPARE DESIGNERS / NON-DESIGNERS?

I thought it would be interesting to look at differences here because people in design typically have some training in processes like the creative process, and because designers are typically seen as working in (traditionally) "creative" fields.

→ What this might point to is that while people feel they have opportunities to be creative at work/school, there are things that are preventing them from feeling like they've reached their creative potential... but what?

- The "magic wand" question hints at some potential reasons. The responses, coded into categories, fell into these buckets:

  #1 MORE TIME + EFFICIENCY
  #2 BETTER FOLLOW-THROUGH
  #3 MORE EXPERTISE AND SKILL IN A DOMAIN
  #4 MORE PERSISTENCE AND MOTIVATION   meh.

INTERVIEWS

From the surveys, I was able to recruit some participants to interview more in-depth about their creative process (I also turned to personal contacts as well). During the interview session, I used the "directed storytelling" method described by Shelley Evenson[6], where a participant tells a personal story of an experience from their past. The goal of conducting these interviews was to understand more deeply the types of frustrations people encounter in their process, situations and places where they felt most creative, and gain insight into their notions and self-perceived level of creativity.

WHAT: 45-minute interviews asking people to talk about a specific project

HOW:

1. Contact people about interviews.
2. Conduct interviews in-person, or over Skype.
3. Analyze by transcribing interviews.

WHO: 20 Participants, 3 pilot participants

WHEN: Most of October 2012 (Oct 1-24)

PARTICIPANTS Some interesting folks I talked to...

Investment Analyst

Consultant / Furniture Designer

Toxicology PhD student

Entrepreneur Business Owner

Social Media Manager

Computer Science student

HIGHLIGHTS A few highlights from the questions I asked...

Q. WHAT WOULD YOUR DEFINITION OF CREATIVITY BE?

"thinking outside the **status quo**."

"meeting challenges and working within constraints"

"it's a lot of times like **CLEVERNESS**."

"the ability to think of something **new**."

Q: ON A SCALE OF 1-10 HOW CREATIVE DO YOU RATE YOURSELF TO BE?

"more like **7** or **8**."

creativity gene? "There's just a certain amount of innate creativity"

3 or **4**. I can't really formulate the idea in my head of new things to do. I'm better at implementing things."

← Designer

"**5**. It's hard in what we do [medicine]. I find it hard to come up with ideas for research because we don't know anything..."

"**5** or a **6**... I prefer to **DO** stuff"

"**7** or **8**. It might be my architectural training which taught me to problem-solve in a non-linear way."

"**10**. Why? Because I try to approach everything differently..." the only one

FINDINGS

① People don't fully understand how the creative process works, and therefore **don't feel empowered** to realize their creative potential.

The survey showed that people (particularly those in a non-design field) felt they were not reaching their creative potential.

- When asked to rate their own creativity level, people who gave themselves lower ratings didn't seem to realize that the creative process **involves both idea generation and execution**. They justified their ratings by saying:

"I'm better at **3** implementing things".

"I have to rely on my seniors to give **5** me ideas on what to do."

"I prefer **5** to **DO** stuff".

→ THE THING IS, THESE PEOPLE **ARE** GOING THROUGH THE CREATIVE PROCESS (They just don't know it!)

One reason: People don't realize that the creative process **involves both idea generation and execution**

WHY?

Another reason? They encounter blocks in the creative process (see ②)

Here's an example of how someone who rated themselves low on creativity went through the creative process (in a nonlinear fashion — based on Sawyer's model): [14]

ACQUIRE KNOWLEDGE	FIND THE PROBLEM	GATHER RELATED INFORMATION	INCUBATE THE PROBLEM	GENERATE IDEAS	EVALUATE IDEAS	DEVELOP & EXECUTE

29 Y.O. ENTREPRENEUR
Started a successful company selling bicycle accessories worldwide

Rated himself less than 5 on creativity!

Existing knowledge of cycling culture, running a business, printing, and a bit of manufacturing

Why aren't there any good solutions for cyclists to be visible at night (while still looking cool?)

Need a job. Also, to do something with my life.

Do some basic market research.

Shelve this problem of "Cyclist visibility at night" for later

If reflective strips could be put on wheels, that would be a non-clunky solution

Think about ideas for jobs/things to do in life. Recall idea of reflective strips for bicycles.

Evaluate possible ideas. Choose the most feasible one (reflective).

(of course, there's more to this story but you get the idea.)

Plan out some initial steps involved with testing different types of reflective film

② People **encounter blocks in the creative process** due to a lack of time, knowledge, or resources, that prevent them from having and developing more creative ideas.

○ The survey I conducted pointed to what some of these blocks might be, and through the interviews I was able to get a better sense of how these blocks impacted people's processes.
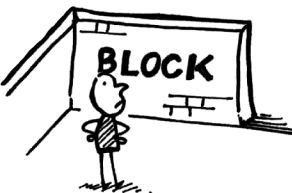
BLOCK

WHAT TYPES OF BLOCKS?

"learning Visual Basic to make the macro was tough [in Excel]."

"it was hard to find someone who had all that experience taking a product from concept to finished product"

"transferring physical things like notes to a digital format"

Here is a table showing how my exploratory research findings applied to the various stages of the creative process (using an adapted version of Sawyer's process model): [14]

ACQUIRE KNOWLEDGE
Mastering the knowledge and skills of a particular domain.

People see knowledge as a barrier to being more creative, and they report needing to rely on the expertise of others.

⇨ HELP PEOPLE OPTIMIZE THEIR KNOWLEDGE ACQUISITION PROCESS, OR CONNECT THEM TO EXPERT KNOWLEDGE.

FIND THE PROBLEM
Noting problems in the world worth solving and framing it appropriately.

People understand this aspect of the process but framing the problem was less salient in people's minds.

⇨ CONNECT PEOPLE TO PROBLEMS WORTH SOLVING, OR HELP PEOPLE FRAME PROBLEMS BETTER.

GATHER RELATED INFO
Being open to and finding information that may potentially be relevant to the problem.

People have problems organizing and keeping track of the information they collected, and dealing with the physical digital divide.

⇨ HELP PEOPLE OPTIMIZE THE WAY THEY ORGANIZE THE INFORMATION THEY FIND

INCUBATE THE PROBLEM
Stepping away from the problem for a while and letting the unconscious work on it.

People feel that technology keeps them always in "on" mode, and that the best ideas can come from unexpected situations.

⇨ EMPATHIZE WITH PEOPLE'S NEED TO SWITCH OFF AND SLEEP ON A PROBLEM.

GENERATE IDEAS
Coming up with various ideas for the problem, or combining previous ideas.

Some people feel that generating ideas is an innate ability. Others want better ways to record ideas, or more opportunities to be in their preferred creative environments.

⇨ HELP PEOPLE OPTIMIZE THE WAY THEY GET AND CAPTURE IDEAS

EVALUATE IDEAS
Selecting criteria to judge ideas, and moving forward with the best ones.

Some people find it difficult to let go of certain ideas, or accepting other people's criticism of their ideas. Others find it hard to settle on just one idea.

⇨ EMPATHIZE WITH DIFFERENT TYPES OF PEOPLE'S NEEDS FOR RECEIVING FEEDBACK AND CRITICISM.

DEVELOP + EXECUTE
Developing an idea further and putting together a plan of action for implementing it.

People have problems creating a plan of action to execute on an idea. Others just wanted more motivation and persistence.

⇨ HELP PEOPLE CONNECT WITH OTHERS WHO HAVE WORKED ON SIMILAR IDEAS, HELP THEM OPTIMIZE A PLAN OF ACTION, OR EMPATHIZE WITH PEOPLE WHO NEED EMOTIONAL SUPPORT.

From a synthesis of the research from the exploratory research phase, four main themes for design emerged, which were used to help guide the design concepts.

Themes for Design

OPTIMIZING
Design better tools for the way people work and organize their information, to help them be more efficient.

EMPOWERING
Empower people to learn about their own process, how it's related to the creative process, so they are in more control over how they work.

EMPATHIZING
Support the emotional aspects of the creative process, such as frustration, motivation, fear, and joy.

CONNECTING
Leverage social networks of real or virtual communities to help people create their "creative network".

After coming up with these design themes, I proposed 3 potential design concepts that I felt fit well with the themes, and that I could describe to get feedback from users. These 3 initial concepts were...

SECRET SAUCE
a website to help you learn about tools, workflow, tips + processes from others in your field + recommendations

PERSONAL CREATIVE NETWORK
get people in your social network to help you with stuff you're not good at

IDEA TRACKER
Track progress of various ideas and efforts based on data from smartphone + web

SECRET SAUCE
What if there was a place where people could go to learn about their own creative workflow, empowering them to learn how it is related to the creative process? This concept would enable people to find creative tools and strategies from other people, allowing them to optimize their workflow.

PERSONAL CREATIVE NETWORK
What if you could find experts from within your social networks who could help you with your ideas? or: what if we could design for the notion of an "idea buddy", someone whom you can bounce ideas with and is there to provide emotional support as you go through the process?

PHYSICAL IDEA TRACKER
What if there was a physical artifact within your home that would help you track all the ideas and projects you had started? This artifact would serve as an empowering reminder of your creative process, as well as help you see how to optimize the time spent on your projects better.

WHAT'S NEXT?

Which of the design themes should I focus on? How do the design themes work together?

These questions was what the next phase, Generative Research, aimed to answer...

GENERATIVE RESEARCH

WORKBOOKS

In general, generative research involves treating users like co-creators or collaborators in the research process, to create artifacts that can creatively express their innate needs and desires while still grounded within the context of my original research question. To do this, I designed three activities that were delivered in an activity workbook-style format, which would enable participants to complete the activities on their own time, without working under the time constraints of a workshop.

The three activities were:
Collage activity
Participatory Design activity
Concept Validation activity

The broad goal of creating these workbooks was to understand what were the relationships between the four design themes, as well as which theme to emphasize moving forward.

WHAT: Physical co-creation activity workbook along with Collage kit

HOW:

1. Meet with participants (from interviews) to explain instructions.
2. Participant fills out activity workbook on their own time.
3. Meet with participant again to discuss responses.

WHO: 6 participants and 3 pilot participants

WHEN: February 2013

WORKBOOK COMPONENTS

WORKBOOK — Each participant was given a large format (11x17") workbook for their responses

HOW DO YOU WORK WITH YOUR IDEAS? — Activity Workbook

GLUESTICK + SCISSORS — For glueing the collage images

POST ITS — For participants to create their own images or callouts

MARKERS — For drawing, doodles

COLLAGE KIT — With a collection of images related to the creative process and various emotional imagery

3 ACTIVITIES

① TELL ME A STORY... (collage creation activity)

② I WISH THERE WAS A... (participatory design activity)

③ WOULD YOU USE THIS? (concept validation activity)

TELL ME A STORY...
(COLLAGE ACTIVITY)

GOALS

① Understand how the 4 design themes (from Exploratory Research) interacted with each other.

② See how various aspects of a participant's process played a role in their current process, or might play a role in their ideal process which might point to a need to focus on one of the design themes more

③ Discover what people believe is missing from their current process that makes it less than ideal

HOW IT WORKED

○ Participants were asked to create 2 collages — one depicting their creative process (based on a project they worked on in the past that they felt was difficult) and another collage to depict their IDEAL creative process (which could be about the same project, or a different one they have yet to start).

○ They were also asked to depict various dimensions of the project, such as:

☐→☐→☐ The **process** of the project

⛰ **Challenges** faced

👥 Nature of the **interactions with people**

♡💭 **Emotions and thoughts** throughout the project

🔧 **Tools and resources** used

For the ideal process collage, participants were to think of what these elements would be like

Who knew? INTERNET MEMES: Actually a good research tool!

I used a collection of images from popular internet memes (especially ones that depicted emotion) for some of the elements in my collage kit. This turned out to be quite well-received by my participants, who were mostly tech-savvy enough to appreciate them, and who felt the memes represented some of the emotions they felt very well.

COLLAGE 1: CURRENT

COLLAGE 2: IDEAL

Show me your current creative process...

...and your ideal one.

HIGHLIGHTS

SEE EXAMPLES ON FOLLOWING PAGES!

Collage #1 - My Process Today

PARTICIPANT A
(SOFTWARE ENGINEER)
"MY PROCESS TODAY"
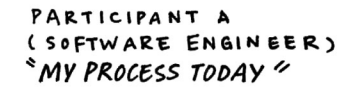
Height of the images corresponded to emotional state (positive was higher)

Felt annoyed that requirements of the project changed and that they were now very stringent

Collage #2 - An Ideal Process

"MY IDEAL PROCESS"

Requirements of the project would be determined first

Everyone would be on the same page!

Collage #1 - My Process Today

PARTICIPANT C
(INVESTMENT ANALYST)
"MY PROCESS TODAY"

Client of the company needed some information and boss wanted the participant to answer them

Felt a bit overwhelmed by the task, because participant had never done this before

Collage #2 - An Ideal Process

"MY IDEAL PROCESS"

Participant considered themselves more creative when cooking

Ideal process would involve having lots of data upfront and easily-accessible, so that the execution stage would have as little hiccups as possible

Participants explaining responses in the Collage Activity.
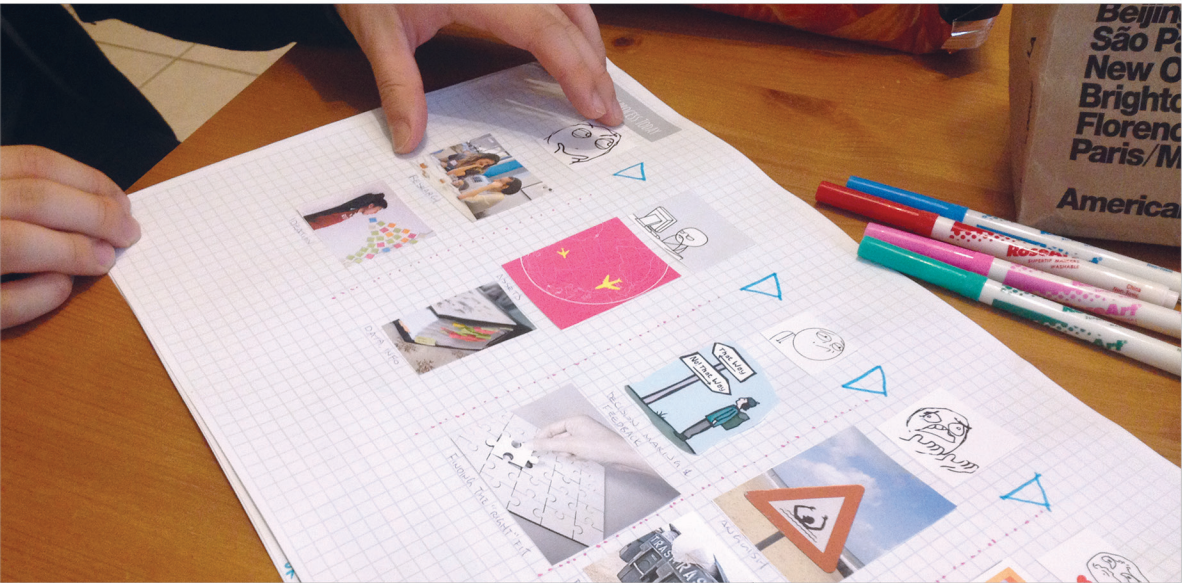
I WISH THERE WAS A...
(PARTICIPATORY DESIGN ACTIVITY)

GOALS

① See what design concepts people feel would be most useful to their creative process (is it an app? a space? a device?)

② See which design themes I should focus on more, based on the concepts generated by participants

HOW IT WORKED

Participants were asked to think of something that they wish existed that would help with <u>their</u> creative process.

- Participants filled out a mad lib that served as an overview of their concept
- Participants then were asked to describe their concept in more detail, including intended users and context of use.

I wish there was a _____ that existed that would do _____ really well.

Describe the idea...

What would you call it? Who would use it? 3 key functions: use when? where?

...and detail it out a bit more.

HIGHLIGHTS

Q: WHAT DO YOU WISH EXISTED THAT YOU FEEL WOULD HELP WITH YOUR CREATIVE PROCESS? (It can be anything!)

I wish there was a program on my computer that would do data organization really well.
called ULTIMATE LAB NOTEBOOK OF AWESOME

ADDED 2 CUPS SUGAR
RECI-RECORDER
I wish there was an app that would record recipes really well.

ROBOTREPO
I wish there was an idea repository that would check for related ideas really well.

called Back to the Future
I wish there was a time machine that would time travel really well.

SEE EXAMPLES ON FOLLOWING PAGES!

NEXT, TELL ME MORE...

What would you call it? Inquirer
(Initial requirement inquirer)

Who would use it?

individual · small group · bigger group (the client) · organization

What are three key functions/features of this thing:
1. Collects specific requirements
2. Auto-generates questions for unforeseen requirements
3. Lists trivial/complex requirements often not included traditionally

When would you use it?

business hours

Where would you use it?

office

DRAW DIAGRAMS TO EXPLAIN

WHAT'S IT LOOK LIKE? · HOW DOES IT WORK?

Input: core functionality
↓
Input: platform info
↓
App generates questions for edge cases of reqs
↓
Ask client if clarification is needed
↓
Input answers
↓
Get final complete/exhaustive requirements

PARTICIPANT A
(SOFTWARE ENGINEER)
"I WISH THERE WAS A..."

Based on the core functionality of the development project, the app will help generate Questions to make the requirements of the project clear

"I wish there was an app that existed that would do requirements collection really well."

NEXT, TELL ME MORE...

What would you call it? robot repo

Who would use it?

individual · small group · bigger group · organization

What are three key functions/features of this thing:
1. Check related ideas/fields
2. Provide implementations of ideas
3. Have an upvoting/collaborative filtering scheme. Also, must include field ideas!!

When would you use it during the course of your day?

All day

Where would you use it?

Computer

DRAW DIAGRAMS TO EXPLAIN

WHAT'S IT LOOK LIKE? · HOW DOES IT WORK?

Entropy

POMDPs · Physics inquiry methods

Uncertainty

Forward Search

Statistical techniques

Control Policies · Particle Filter · Kalman Filter

Gaussian · Non-Parametric

POMDPs, Koslbling et al.
tags: uncertainty, action selection
Implementations: . . . .

Particle Filtering
Tags: . . .
Implementations: . . .

Information theory
tags: . . .
Implementations: . . .

PARTICIPANT B
(ROBOTICS PHD STUDENT)
"I WISH THERE WAS A..."

Areas of inquiry in robotics along with their relationships and connections

Will show the top papers related to an area of inquiry, determined by the crowd

"I wish there was an ideas repository that would check for related ideas really well."

WOULD YOU USE THIS?
(CONCEPT VALIDATION ACTIVITY)

GOALS

① Capture people's feedback and thoughts about high-level design concepts

② Find out, even if people did not like an overall concept, if they still experienced a need that had informed the concept in the first place.

I like it!

It's not secure enough!

I'd never use this.

HOW IT WORKED

Participants were shown three storyboards that illustrated how the design concepts I designed at the end of the Exploratory Research phase might be used. They were then asked: if

- Would you use this? (Get initial reaction)
- Have you ever experienced a need to...
- How would you improve it?

CREATIVE NETWORK · TELL ME MORE...

1. 2. 3.

Umm...

Provide feedback on 3 storyboarded scenarios...
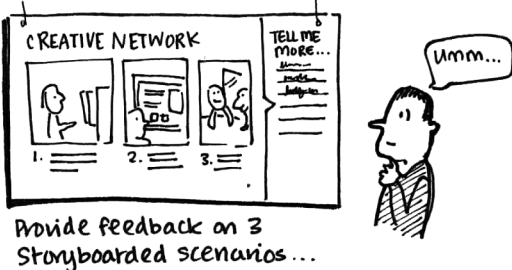
STORYBOARD
CONCEPT #1.
SECRET SAUCE

Q: Have you ever experienced the need to find out about the tools and processes that others in your field are using?

"I would like the idea as long as you have some way of screening for quality recommendations."

Secret Sauce
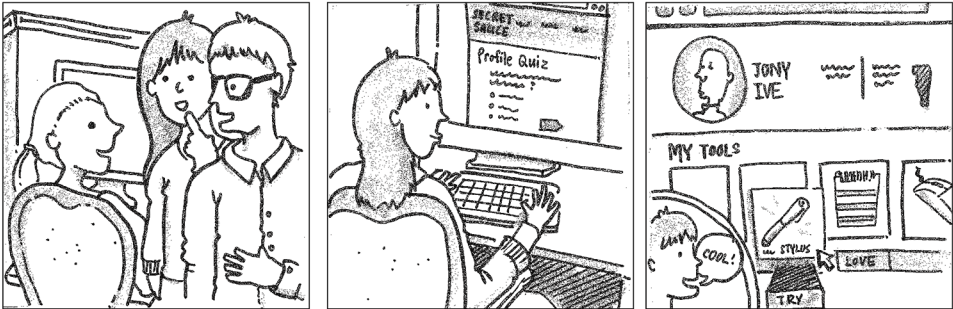
1. Alex is a junior designer. While talking to her colleagues, she hears about Secret Sauce, a place where some of them have started sharing their processes and the tools they can't live without at work.

2. She goes on the site and signs up for an account. While setting up her account, Secret Sauce prompts her to take a short quiz, so that she can have a chance to learn more about her *own* process and share it with others.

3. After she's done setting up her profile, she browses through the list of other designers who have joined the site. She sees a designer that whose work she admires very much is also on the site and checks out his profile. As she browses the tools that he uses, she sees that he uses a tablet stylus she's never heard of before. She adds it to her list of tools she'd like to try, thinking that it might help her create the same sketches she admires.

Let's Hear It...
Would you use something like this? What do you like about this idea? What could be improved?

"I would appreciate an upvote / popularity scheme, to quickly find the things I like."

"Provided that the quiz is short, I'd use this."

"In a science context I could see how sharing protocols/ ways to approach similar questions could be used like this."

STORYBOARD
CONCEPT #2.
CREATIVE NETWORK

"I don't want help with a business plan from someone I don't know well or trust."

"It makes it easy to find people with a particular skillset."

Creative Network

1. Jamie has a great idea for a small startup business selling custom furniture, but has no idea how to go about it.

2. A few months ago she joined a service called The Creative Network because her friend Sam had invited her to it. She finds out that with the Creative Network, she can share her expertise and skills in furniture making with her friends and acquaintances. At the same time, she can also call on the expertise of the people in her creative network to receive advice on moving her startup idea forward.

3. She sees that a good college friend of hers—Will—is currently a financial adviser in the same city. The two reconnect and meet over coffee, and Will offers her advice on creating a business plan.

Let's Hear It...
Would you use something like this? What do you like about this idea? What could be improved?

"Professionals giving away free advice could pose a legal problem."

Q: Have you ever experienced the need to connect to others in your social network for help in an area you don't have expertise in?

"I wish there was a way to guarantee everyone involved is _actually_ going to help."

STORYBOARD
CONCEPT #3.
IDEA TRACKER

Q: Have you ever experienced the need to keep track of your ideas and projects in one place so you can stay motivated?

"I'd like a way to 'zoom in' and look at my data."

PHYSICAL IDEA TRACKER

Let's Hear It...
Would you use something like this? What do you like about this idea? What could be improved?

1. Lee has a day job, but he also have various ambitions and hobbies which he is keen on improving. These include writing his first novel, practicing guitar and working on learning a new programming language for work.

2. Over the holidays, Lee decides to dedicate some time working on his novel. Sometimes it's difficult, but he persists.
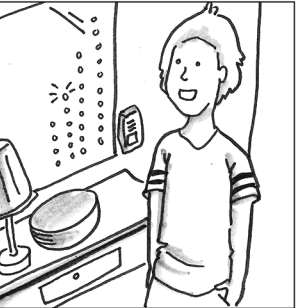
3. As he progresses with his novel, the IdeaTracker system in his home takes the activity data from his computer and mobile devices and accordingly, reflects his progress. The Idea Tracker gives Lee a subtle, visual representation of where he is with all of his ideas for projects, and helps him stay motivated and on moving forward with all of his ideas.

"I can track my own progress and stay motivated all on my own."

"Adding a competitive aspect might be interesting."

"Feels like some active intervention needs to happen."

At the end of the day, I collected a **MOUNTAIN OF DATA**. And since these design-based research methods yield data that isn't as straightforward as surveys and interviews, it's probably good to talk about how I analyzed all of it.

EVEREST
KILIMANJARO
DATA
*Artist's exaggeration

Px1 Px2 Px3
Generative Research Analysis
P1
P2
P3
P4
P5
P6
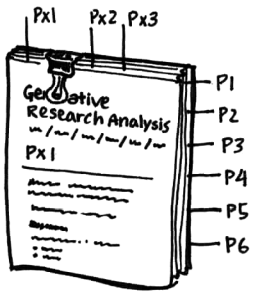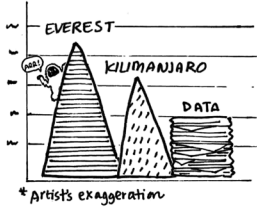
First, I compiled all responses into one **60**-page document, organized by Participant and then the various responses to the activities.

• For the collage, I entered notes and quotations for each of the aspects I was looking at (i.e. process, challenges).

Next, I looked for Commonalities and Patterns in the data, specifically in the following "buckets"

PROBLEMS CHALLENGES
IDEAL PROCESS
STORYBOARD FEEDBACK

What common problems are people facing?

Is there any similarity in how people want their "ideal state"?

Are there any common concerns or comments about the 3 storyboards?

FROM WHERE?
• Collages
• Collages
• Participatory Design
• Concept Validation

Higher-level categories grouping examples together

Examples from participants

This would relate to the "optimizing" design theme
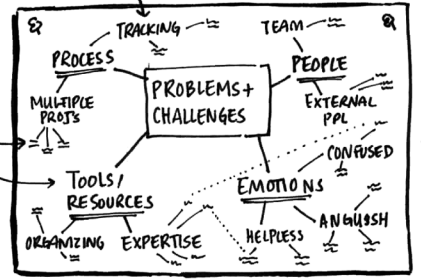
Which, if you recall, are:
♥ EMPATHIZING
↗ OPTIMIZING
EMPOWERING
CONNECTING

TRACKING TEAM
PROCESS PEOPLE
PROBLEMS + CHALLENGES
MULTIPLE PROJ'S EXTERNAL PPL
CONFUSED
TOOLS/ RESOURCES EMOTIONS ANGUISH
ORGANIZING EXPERTISE HELPLESS

Since the goal of this research phase was to find out how the design themes interacted with each other and which one(s) people may benefit the most from, I organized the first two buckets of data into charts like this.

I organized data from the Concept validation activity similarly, too.

GOOD
#1 THE NEED #3
CONCERNS
IMPROVE-MENTS STORYBOARD FEEDBACK
#2

As I was completing this whole process, I was keeping track of HUNCHES I was having while immersed in the data:

HUNCH 3:
Things to pay attention to:
- Collaboration/being on the same page
- Gathering/organizing data
- data discovery

These are common problems I felt I saw cropping up again and again.

HUNCH 5:
People saw Problems when trying to master a domain where they need to just find that BASE KNOWLEDGE

In my Exploratory Research a lot of people said more expertise + skill would increase their creativity.

HUNCH 8:
Many people want PREDICTABILITY + STRUCTURE as a critical part of their ideal creative Process

In the "Ideal Creative Process" collages, some people wanted lots of data on hand to help them make decisions and plans. A few, less so. Many also echoed this sentiment in the Participatory design activity.

I was also keeping track of ideas for final design concepts that cropped up from time to time (more on those later). One finding I had early on in the analysis process:

FINDING 1: DIRECTION OF INFLUENCE
Seems like people / tools + resources → emotions

Remember, one of my goals for this phase was to see how the design themes interacted.

People issues
Tools & Resources issues
→ Emotions 😟😊

In other words, people's frustrations with tools/resources and people resulted in emotions.

WHAT'S A HUNCH?

I decided to call these ideas I was having about what the data might mean "hunches" because they were very preliminary ideas — much like the "preinventive structures" Finke, Ward and Smith talk about. This idea was also popularized by Steven Johnson, author of Where Good Ideas Come From [8] who wrote that the biggest ideas don't always come

STEVEN JOHNSON

as singular epiphanies, but rather as half-baked ones that need to collide with others to result in the BIG idea. Calling them hunches means you don't have to worry whether they are **correct or not**, because they're not Findings (with a capital "F" that need more evidence backing it).

Analyzing and synthesizing data from Generative Research.

This is what it feels like to have un analyzed data in your head.
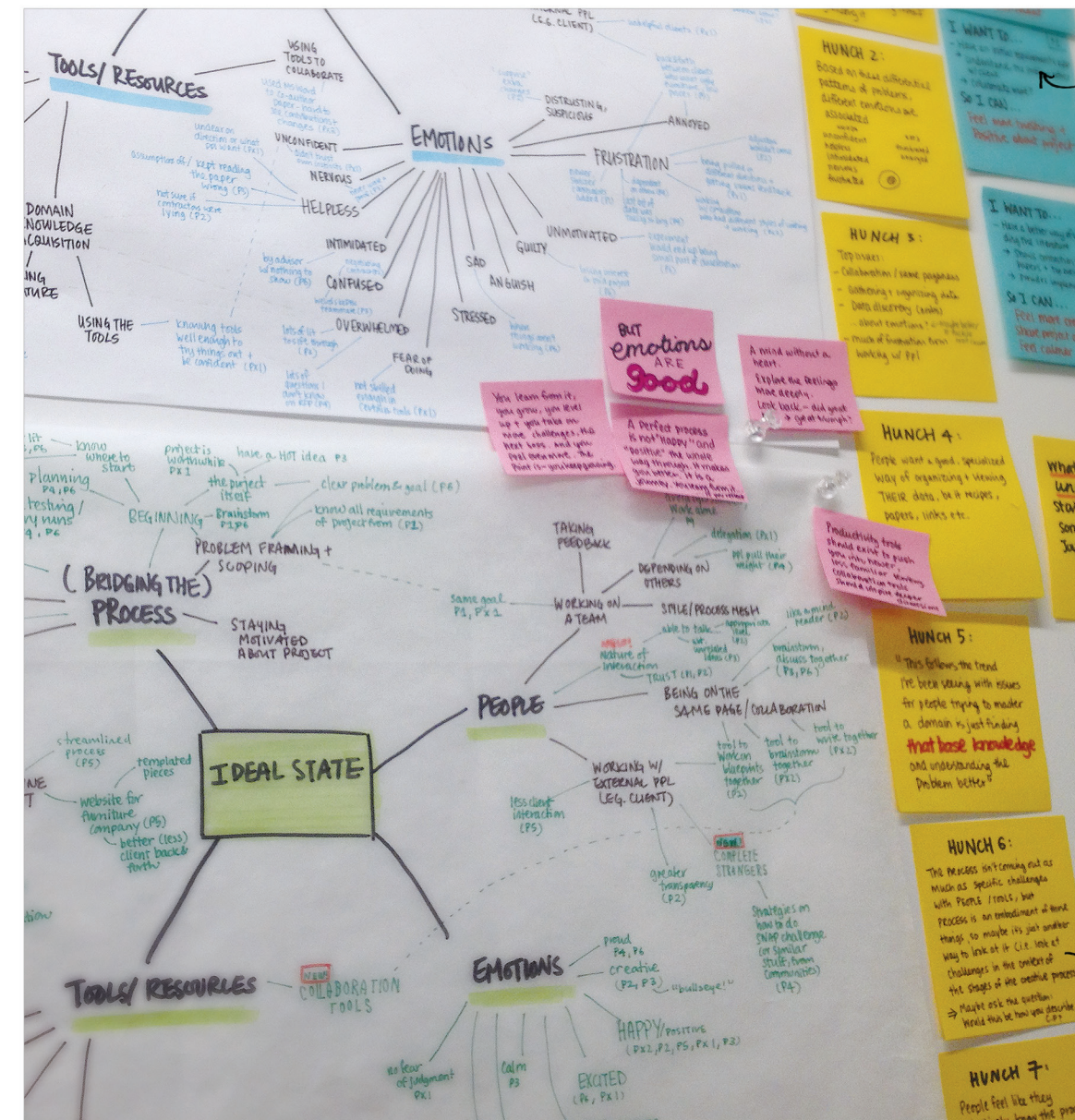
At this point, I felt a bit **STUCK**. I had a finding and some hunches, but I needed something to hold it all together..

I was looking at my wall of partially-analyzed data, particularly looking at the emotions People described present in their current creative process... and thinking:

EMOTIONS — DISTRUST
— GUILTY
— SAD
— CONFUSED
UNCONFIDENT — INTIMIDATED
— NERVOUS

Do I really want to design something that aims to eliminate negative emotions?
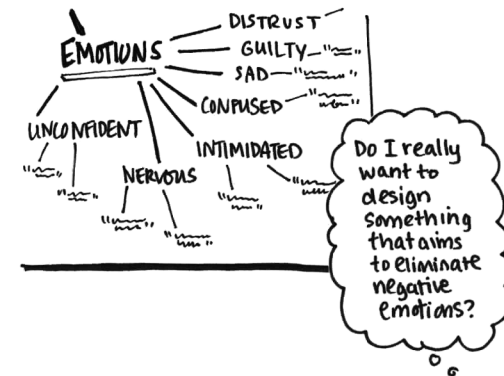
My gut feeling told me: *No...*

I even made myself write this post-it to remind myself of this gut feeling:

BUT emotions ARE good

UMAIR HAQUE

Harvard Business Review

Well, until I stumbled onto an article written by Umair Haque, an economist and author (shared via Facebook, no less). It was called:

LET'S SAVE GREAT IDEAS FROM THE IDEAS INDUSTRY [7]

Haque's main point in the article critiques the way we've come to think about ideas and share them (such as the medium popularized by the **TED** conference talks.) He asks:

" THE IDEA OF OUR AGE IS THAT GREAT IDEAS CAN BE SIMPLIFIED, REDUCED, MADE INTO CONVENIENT DISPOSABLE NUGGETS OF INFORMATION — BE THEY 18-MINUTE TALKS... OR 140-CHARACTER BURSTS. BUT CAN THEY — REALLY?"

He believes that through TED talks and "thought leadership" blog posts, we've all come to enjoy reading and experiencing the epiphany of these Great Ideas — except we don't get to experience the confusion, ambiguity and nuance that are a part of those ideas.

"[GREAT IDEAS] GIVE US THE CLIMAX OF EPIPHANY, WITHOUT THE CHALLENGE AND TENSION OF **THOUGHT**."

TED

Well, I can't say I completely agree with Haque's article, but at the very least, it gave me something to think about, and a frame to look at my data through. *hmm...*

In the end, reading that article helped a few hunches come together:

BUT emotions ARE good

FINDING 1: DIRECTION OF INFLUENCE seems like people / tools + resources → emotions

Designing something obvious like this but ultimately non-useful doesn't seem like the answer...

I don't want to end up designing yet another idea capture tool... THOUGHT I HAD FROM EARLY IN THE PROJECT

A perfect process might not be "happy" the whole way through.

If you ask people to look back... did great pain = great triumph?

Great ideas are complex and nuanced (and so is creativity.) We need the challenge!

Let's Save Great Ideas from the Ideas Industry

UMAIR HAQUE

"I wish I were better at ___" People expressing their struggles from Exploratory Research..

ESSENTIALLY... HERE I WAS, LOOKING AT THE DATA LOOKING FOR THE KEY TO PEOPLE'S CREATIVITY... CREATIVE PROCESSES AREN'T PERFECT, BUT THAT'S OKAY. IF THEY WERE, THERE WOULD BE NO JOY IN DISCOVERY OR INVENTION, AFTER THE HOURS OF HARD WORK, CONFUSION AND UNCERTAINTY. SO IT'S IMPORTANT TO RECOGNIZE THESE REALITIES OF THE CREATIVE PROCESS.

HUNCH 3: Things to pay attention to: - collaboration/being on the same page - gathering/organizing data - data discovery

HUNCH B: Many people want PREDICTABILITY + STRUCTURE as a critical part of their ideal creative process

The struggles people talked about from Generative Research, and people's desire for a structured and predictable process...

Thinking from this perspective gave me a way to make sense of the data. Here are some findings:

FINDINGS

- The concepts people came up with and in the "Ideal Creative Process" collages both reflected end goals of:
  - wanting to feel proud of the work and being able to share it
  - feeling less frustrated, happier, and more confident

- Many of the "Ideal Creative Process" collages were also very pristine and devoid of potential issues that might turn up. Only 2 of the collages had a "troubleshooting loop" that described what they would do if things went wrong.

- In the Participatory Design Activity, many people's concepts were specifically designed for their particular needs and workflow.

- In most of the "Ideal Creative Process" collages, people didn't really depict any negative emotions on them. They were predominantly positive.

- It seems that many negative emotions arose when people hit points in their process where what they were working on was ambiguous, confusing or challenging.

CONCEPT VALIDATION FINDINGS

The main issues that people were concerned with involved:

TRUST & PRIVACY
"I wouldn't use it [Storyboard #3/Idea Tracker] if it was on my wall because then everyone could see the goals and ideas I'm working on."

PROVIDING CLEAR VALUE & USEFULNESS
Many people were worried about having to sift through endless amounts of information (e.g. the tools in Storyboard #1 / Secret Sauce) to find something useful to them

CREDIBILITY OF USERS ON A SOCIAL NETWORK
"How can I trust a doctor who gives out free advice?"—Referring to Storyboard #2 / Creative Network)

My results from Generative Research allowed me to add onto my findings from Exploratory Research. Here they are mapped to the various stages of the creative process again.

ACQUIRE KNOWLEDGE
Mastering the knowledge and skills of a particular domain.

Mastering a domain was tough for people, and caused a great deal of negative emotions, such as feeling overwhelmed. Though some people have mentors / advisors to point the way, tools to help people with this (such as databases of academic papers) sometimes fall short.

FIND THE PROBLEM
Noting problems in the world worth solving and framing it appropriately.

For participants of the workbook activities, most of the issues arose from not being clear on the goal/ nature of the problem with others, which resulted in feelings of distrust, annoyance and frustration.

GATHER RELATED INFO
Being open to and finding information that may potentially be relevant to the problem.

People expressed problems organizing and finding information that they've collected for their project. A few Participatory design activity responses involved people wanting to create highly personalized tools for their own use.
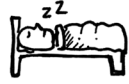
INCUBATE THE PROBLEM
Stepping away from the problem for a while and letting the unconscious work on it.

Though not many people talked specifically about incubating a problem, this stage is still crucial for whenever one is "stuck" on a problem (even though the act of it is not as salient in people's memories).

GENERATE IDEAS
Coming up with various ideas for the problem, or combining previous ideas.

In many people's "Ideal Creative Process" collages, this was the stage where the magic happened. The good ideas would come automatically. However, because no one talked about a specific big "aha" moment, this likely supports the idea (from Czikszentmihalyi, Sawyer) that this stage involves smaller epiphanies.

EVALUATE IDEAS
Selecting criteria to judge ideas, and moving forward with the best ones.

For people, having one's ideas evaluated often caused some anxiety, and intimidation, especially when discussing with someone more senior. People prefer to bounce ideas off more intimate contacts first.

DEVELOP + EXECUTE
Developing an idea further and putting together a plan of action for implementing it.

People expressed issues with planning / tracking multiple projects, as well as finding ways to streamline their process. The tools people used for this were sometimes a source of frustration, as was just collaborating with others to get something done.

WHAT DOES IT ALL MEAN?

FIND OUT!

WHAT DOES IT ALL MEAN?

One of my first findings was that:

PROCESS

Skills/knowledge with tools + resources

Interactions with people

EMOTIONS

"gosh I messed up"
"yay! I did it"
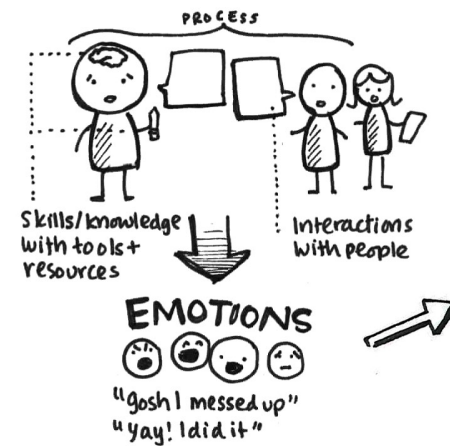
In other words, the experience of an individual moving through the creative process is affected by their skills / knowledge with tools and resources, and their interactions with others. Issues in these areas result in either positive/negative emotions.

⬦ FOCUS: EMPATHIZING WITH EMOTIONAL ASPECTS OF CREATIVITY

From Generative Research, I decided to focus a bit more on the emotions. Why?

① I could address the "root" problems that are causing the emotions, but the tools people use and who they interact will change from situation to situation, so it's better to help them alleviate and balance out their emotions (it's more realistic of an aim)

CURRENT
OVERWHELMED GUILTY CONFUSED SAD SCARED
HAPPY PROUD JOY

IDEAL
OVERWHELMED CONFUSED SAD
CONFIDENT JOY HAPPY PROUD

② In the TOOLS AUDIT, there was an opportunity to design something that provides emotional support
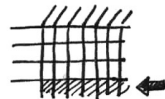
③ Simply creating yet another productivity tool to capture ideas, for example perpetuates the "magic bullet" myth that this one tool will help lead to a magically better creative process.

WORK FASTER!
COLLABORATE EASILY!
HAVE BETTER IDEAS!
SUPER APP!

CURRENT
LIFE → B
A

IDEAL
A → B

Current productivity tools promise to get you from the start of a project (A) to end (B) faster.

But when it comes to being creative, do we really want it to be a quick and painless process?
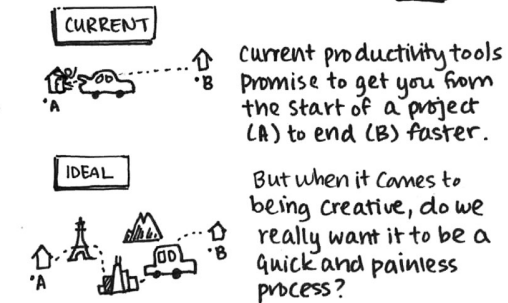
HOW CAN THE DESIGN CONCEPTS HELP PEOPLE HAVE A MORE REALISTIC PERSPECTIVE OF THE CREATIVE PROCESS AND THE

?? confusion
ambiguity
chaos

THAT COMES WITH IT?

Guided by the design themes, I wanted to create design concepts that would help support and build:

- **emotional resilience**
- **resourcefulness with tools and connectedness with people**
- **reflection on one's process to gain a deeper understanding of one's own process**

YOU CALL THIS AN ARTICLE?!
I'll be okay... I'll do better next time.

Ugh I can't figure this bug out. Maybe I'll ask my buddy and see if there's a better way...

OK I can't stay up too late because I know my writing goes downhill at 2am...

emotional resilience

Depending on a variety of different factors (such as teammates, the tools being used, etc), things are always bound to go wrong at some point. How can my design concepts help people bounce back more quickly and "roll with the punches"?

resourcefulness with tools and connectedness with people

There is no such thing as a perfect tool, since this will always vary based on the task at hand. That's why it's important to give people a means of seeking help from others when they are stuck, or finding alternative tools and ways of completing a task.

reflection on one's process to gain a deeper understanding of one's own process

Without reflecting and understanding one's process, it's easy to keep repeating the same mistakes and bad habits that lead to frustration in the creative process, (and overlook the good things that are working.)

DESIGN CONCEPTS

SELECTING DESIGN CONCEPTS

After I completed the Generative Research phase, I reviewed all of the concepts that I thought held potential moving forward. Some concepts, I came up with earlier on in the project—others I had quickly jotted down on a post-it as I was analyzing and synthesizing the data. Some of these concepts are presented here:

CREATIVITY GAME
- your project is the main character
- search for info/research on "quests"

THESIS

↱ SOME WERE STRANGE...

IDEA TRACKER
Track progress of various ideas and efforts based on data from smartphone + web

CREATIVITY KIT
Make your own...

INSPIRATION CARDS
EARPLUGS
SPECIAL MUSIC

DESIGN THE IDEA BUDDY/ CREATIVE PARTNERSHIP RELATIONSHIP
- People prefer to confide in closer networks which they say helps their process

CREATIVITY MOTIVATION FURBY-THING
- Talk to it about your feelings during the creative process
- Chuck it against the wall

I'M BACK

↱ PROBABLY A BAD IDEA

SECRET SAUCE
a website to help you learn about tools, workflow, tips + recommendations from others in your field
+ recommendations

THE HALL OF SHAME (AND FAME)
A physical space...
Where creativity failure stories live to help people learn

Let's celebrate failures + bad starts ...and website

TOOL TO ENABLE REFLECTION + ANALYSIS
Something that helps people reflect on their process, look back at what frustrated them

=squeeze=

"MORE CREATIVE IN..." YOUTUBE CHANNEL OR ONLINE COURSE
Kind of like a workshop. But addresses different aspects of creative process

---

I ended up developing and fleshing out the following 4 concepts:

SECRET SAUCE
a website to help you learn about tools, workflow, tips + processes from others in your field
+ recommendations

DESIGN THE IDEA BUDDY/ CREATIVE PARTNERSHIP RELATIONSHIP
- people prefer to confide in closer networks which they say helps their process

THE HALL OF SHAME (AND FAME)
A physical space...
Where creativity failure stories live to help people learn

Let's celebrate failures + bad starts ...and website

TOOL TO ENABLE REFLECTION + ANALYSIS
Something that helps people reflect on their process, look back at what frustrated them

=squeeze=

Why 4 concepts??
I decided to push forward with 4 concepts because I wanted to convey that there is no one correct final solution or answer to my research question. Instead, I wanted to show that understanding and enhancing one's creative process is complex, and the concepts —which address the design themes to different extents— are just a few ways of approaching the question.

HOW DID I CHOOSE THESE 4? →

I initially based my decisions on gut instinct (how well I felt the idea would work with my design themes).
I confirmed later that they did with this chart.

I also renamed and imagined the branding for each concept! ↘

	SECRET SAUCE	REFLECTION TOOL (A.K.A "CREOS")	IDEA BUDDY RELATIONSHIP (AKA "COPILOT")	THE HALL OF SHAME (AKA "UNDER THE RUG")
EMPOWERING — To what extent does the design concept empower people to understand their own process?	●	●	◑	◑
CONNECTING — To what extent does the design concept connect people together in a "creative network"?	◑	○	○	◑
OPTIMIZING — To what extent does the design concept connect people to better tools/knowledge to help them be more efficient and skilled?	●	◑	●	○
EMPATHIZING — To what extent does the design solution empathize with the emotions people feel when going through the creative process and give them a more realistic perspective of the process?	○	●	●	◕

← an empty circle just means it addresses the theme to a lesser extent!

more details on each concept →

CONCEPT #1   SECRET SAUCE

WHERE IT STARTED

This concept started off as an idea for a class project looking at the problem of there being so many creativity support tools available today but a lack of a good way to see them all in one place, and more importantly, see which ones work best for a given individual.

WHAT INFLUENCED IT

From my research, I found that students and young professionals differ from seasoned experts in domain knowledge and skills, and report feeling overwhelmed when having to master a new domain quickly, or frustrated when learning new tools.

So many menus and tabs...

WHERE IT ENDED UP

The final form for this concept stayed pretty much the same (as a website/platform), though it did move from being a class project to a full-fledged thesis concept.

HOW IT WORKS
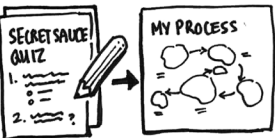
① Reflect on your own process by taking the Secret Sauce Quiz, and sharing the results with others.

② Based on your profile, receive recommendations on what tools/tips to try.

③ Learn about what tools others use in their work, and save them to a list to try out later

SECRET SAUCE — a website to help you learn about tools, workflow, tips + processes from others in your field + recommendations

WHAT IT IS

A platform for discovering new tools, tips, and processes that make up a person's "secret sauce".

SIMILAR IDEAS

WonderHowTo
wonderhowto.com
- place to share tutorial videos and articles on topics ranging from Photoshop to gambling
- however, it doesn't have the ability to let people talk about specific tools they use

THE SETUP / lifehacker
usesthis.com
lifehacker.com/tag/how-i-work
- blog-format sites that features prominent people talking about tools they use to get stuff done
- however, can't cross-reference or get recommendations; it's just an article

Photo credits: lifehacker.com , etsy.com

"SECRET SAUCE" HOMEPAGE

Users see this page when they first arrive on the site. This page explains to the user how secret sauce works and gives various incentives for signing up.

1 HOW IT WORKS
This graphic explains how Secret Sauce works quickly and simply.

2 SIGN UP AREA
From Concept Validation, participants noted that it would need to be clear what the benefits of signing up were as opposed to simply browsing as a guest.

3 PEOPLE ON SECRET SAUCE
Prominent industry leaders can be featured up front to provide an incentive to browse the site.
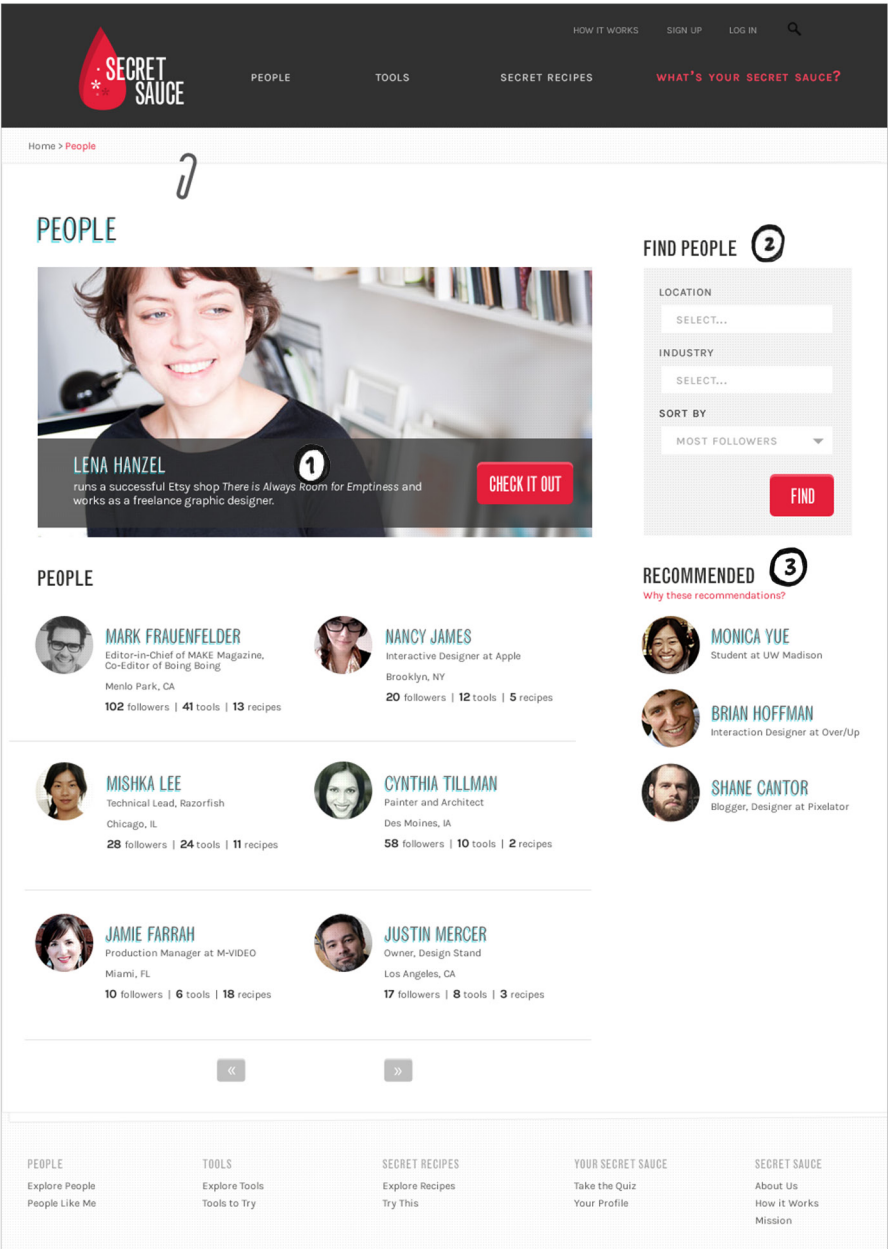
"SECRET SAUCE" PEOPLE PAGE

Users see this page when they click on the "People" link in the main navigation bar.

1 FEATURED MEMBER
Notable people can be featured more prominently as the main hero image, which also helps boost their credibility and number of followers

2 SEARCH WIDGET
Search for users in a specific region or in a particular field

3 RECOMMENDED PEOPLE
In Concept Validation, a few people remarked that they would not know who to follow in their field, so this panel provides a starting point. Recommendations are based off of people you may know, or industry leaders in the field.

"SECRET SAUCE" PROFILE PAGE

Users see this page when they click on the name or picture of a Secret Sauce user. This page shows information about the user, such as the tools they recommend.

① PROFILE INFORMATION
Gives an overview of who the user is, such as location and profession.

② TOOLS AREA
Shows what tools the user recommends and uses.

③ SAVE BAR
Allows saving tools to various lists like "Want" or "[Already] Using".

④ SECRET RECIPES
Shows what tips and tricks the user finds useful.

"SECRET SAUCE" PROFILE PAGE

① PROCESS VISUALIZATION
After taking the secret sauce quiz, the results are displayed on the user profile page (after being edited and approved).

② WHAT'S THIS STAGE? TOOLTIP
Shows more information about a stage of the creative process on hover, and tools that support that stage.

"SECRET SAUCE"
TOOL DETAIL PAGE

Users see this page when they have clicked on the name of a tool in secret sauce. This page shows how users of secret sauce are using the tool.

① SIMILAR TOOLS
Shows tools that have similar functionality

② TOOL IMAGES
Shows images of the tool, which can be either scraped from search engines or submitted by users

③ TOP RATED FOR...
Shows what stages of the creative process members find it the most useful for

④ HOW I USE IT...
Based on users' recommendations of the tool and their tips for how to use it, this area compiles some of the most informative comments about the tool from users.

"SECRET SAUCE"
QUIZ PAGE

Users see this page after they have signed up for an account and decide to take the secret sauce quiz. The page shown is just one of the questions in the quiz.

① QUIZ QUESTION
Questions are designed to help people reflect on their creative process and be fun to answer as well.

② SKIP BUTTON
There is no pressure to finish the quiz in one sitting—users can easily resume it later (though it is just 6 questions).
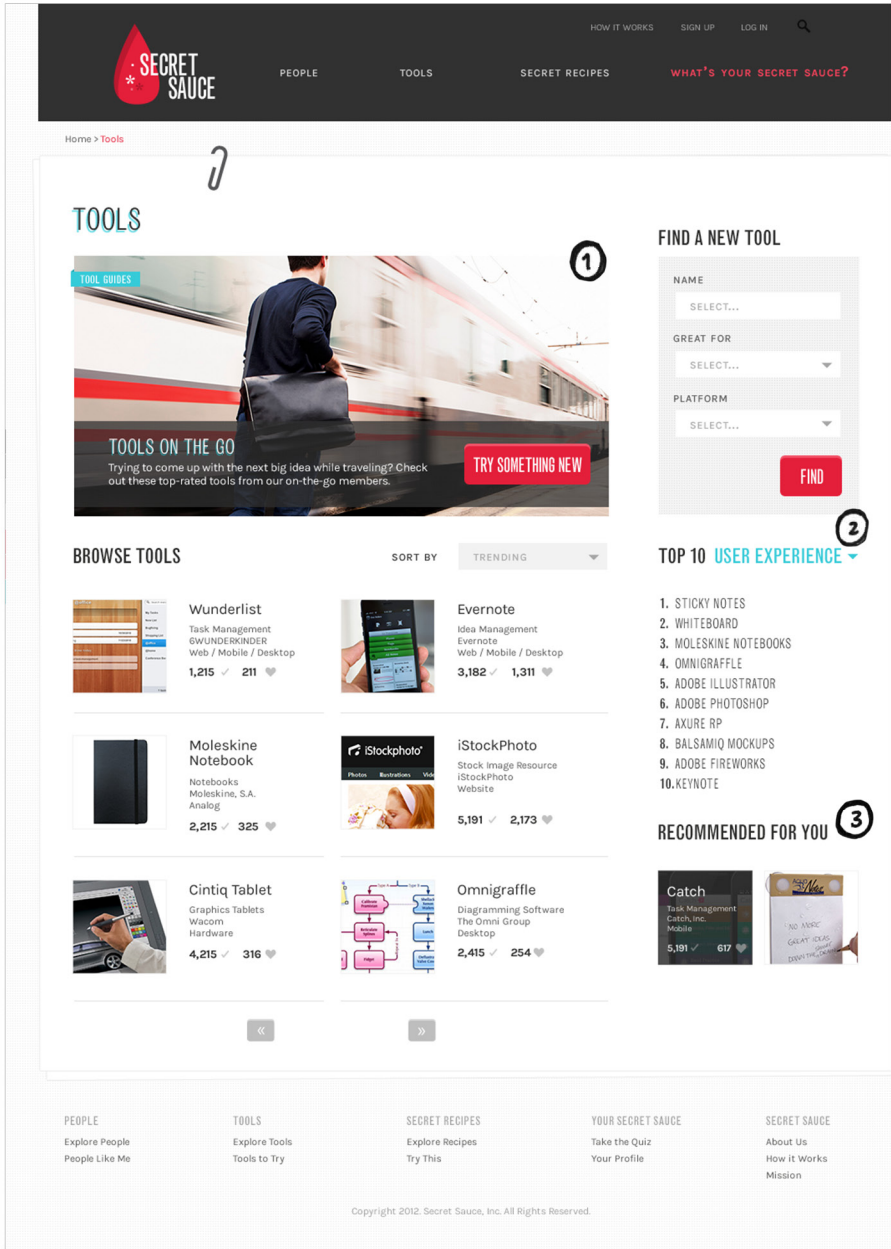
**"SECRET SAUCE"
TOOLS PAGE**

This page shows all the tools on the site.

1. **TOP 10 IN...** Shows the Top 10 tools used by people in a certain field, which is useful for novices trying to figure out where to start learning skills.

2. **RECOMMENDED TOOLS** Based on the user's profile (including tools they want to try and/or are already using), recommended tools that might complement their process are shown here.

3. **FEATURES AREA** This area can show thematic content such as "tools for traveling creatives"

CONCEPT #2 copilot

DESIGN THE IDEA BUDDY/ CREATIVE PARTNERSHIP RELATIONSHIP
- People prefer to confide in closer networks which they say helps their process

WHERE IT STARTED

The initial idea involved designing an "idea buddy" relationship (who is someone you bounce ideas off of).

WHAT INFLUENCED IT

In my generative research, I found that students and young professionals often feel intimidated presenting initial ideas to superiors; instead they prefer to reach out to a more intimate network of peers for feedback and validation first.

WHERE IT ENDED UP

For the final form of this concept, I decided to design something that would support existing idea buddy relationships because designing and building relationships from scratch would likely be difficult, forced, and unnatural.

HOW IT WORKS

1. Chat with up to 2 other idea buddies in a private space, and bounce ideas off each other.
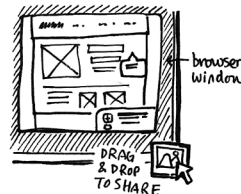
2. When an idea has progressed to a more developed state, you can comment on more specific aspects of the work.

3. Continue the discussion on mobile devices as well, for idea buddies far away.

WHAT IT IS

A cross-platform tool to help you get feedback on your ideas and share what you're working on with your idea buddies.

SIMILAR IDEAS

in VISION invisionapp.com
- Collaborative platform for design teams to view clickable prototypes of mockups and comment on them
- however, it seems mainly geared for designers, and doesn't appear to have chat integrated

Google Docs + Google Chat/ Hangouts drive.google.com
- realtime collaborative editing tool and a chat tool that's integrated into the document editing view
- however, it's difficult to talk about and comment on file types that aren't native to Google Docs
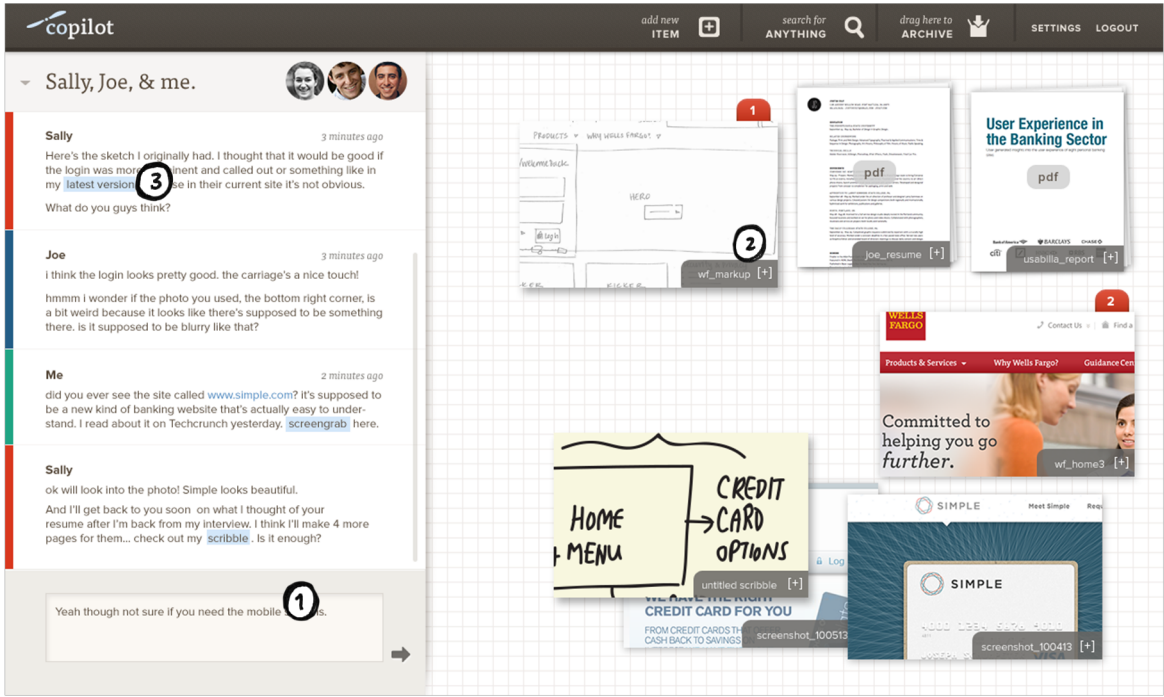
"COPILOT" MAIN CHAT ROOM

People see this screen if they are a participant in a Copilot chat room.

1 CHAT AREA
The large size of this area places an emphasis on the conversation. Only 3 people (or "idea buddies") are allowed for each "chat room". From my research I'd found that this was the maximum number of "idea buddies" people usually had.

2 SHARING WORK
Enables users to drag-and-drop what they are working on to get feedback from others

3 TEXT LINKING
Enables a user to link a word in chat to an item, so that the chat is contextualized for future reference.
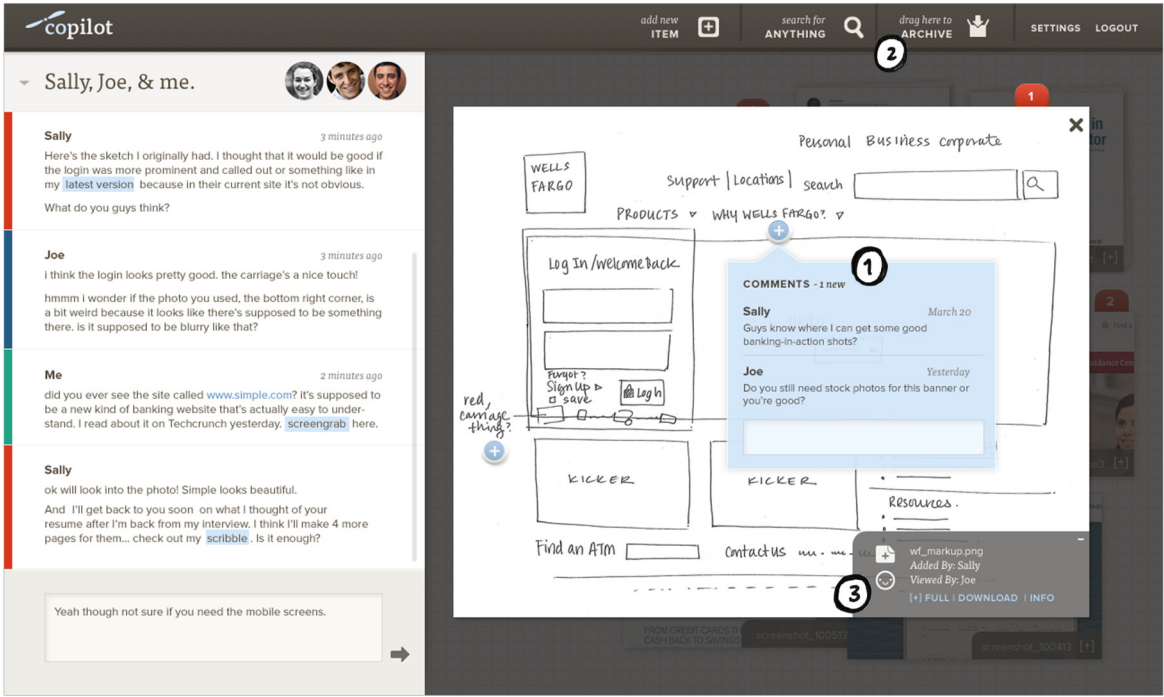
"COPILOT" COMMENTING VIEW

People see this screen if they clicked on an item, which then expands to a larger view.

1 COMMENTS
Participants can leave specific comments about the work

2 ARCHIVE
Older items can be dragged to this area for archiving

3 EMOTICONS
Allows participants to leave an emoticon reaction (e.g. thumbs up, applause) for easy interaction

CONCEPT #3

UNDER THE rug

WHERE IT STARTED

This concept, when I first thought of it, was a website that would allow people to share the work that they are ashamed or embarassed about (which could be work from early in a career, something that was rejected or failed, bad ideas, etc.)

WHAT INFLUENCED IT

I found that students and professionals sometimes forget that feelings of fear, doubt and confusion are when engaging in challenging creative work, and a sign that they are operating outside of their comfort zones.

WHERE IT ENDED UP

In the end, the final form of this concept involved a physical component — a wall — and a digital component — a website. The wall provides people who work within the same physical space (e.g. a lab, studio, or office) an opportunity to share examples in a common, semi-private area whereas the website enables a wider reach.

HOW IT WORKS

① Post up examples of creative failure locally

② Discuss examples with others in a humorous, lighthearted way.

③ Share with a broader audience via the website.

THE HALL OF SHAME (AND FAME)
A physical space...

Let's celebrate failures + bad starts ...and website

where creativity failure stories live to help people learn

WHAT IT IS

A physical (and virtual) place to share your creative failures, learn from the experiences of others, and celebrate the emotional ups and downs of creative work.

SIMILAR IDEAS

big think DANGEROUS IDEAS

bigthink.com/blogs/dangerous-ideas

° a collection of blog posts discussing radical (and sometimes "bad") ideas from thinkers worldwide

° however, these ideas are only submitted by experts, there's no way for many others to contribute

---

"UNDER THE RUG"
PHYSICAL DISPLAY

This is the physical prototype I created for the Graduate Studio Space. I asked for examples of creative failures from students, faculty, alumni, and industry professionals to display in the cafe area of the studio.

① SUBMISSION
Each submission included a visual representation of the submission, along with a brief story describing why it was a creative failure.

② CONTRIBUTION AREA
Magnets clustered around an area invited people to add their own work.

"UNDER THE RUG" PHYSICAL DISPLAY

I created custom magnets that would encourage easy commenting from both the contributor and viewers.

The physical display creates a sense of camaraderie between people in a shared physical space, by altering the conversation around what constitutes a "failure" as opposed to "just another idea for the board".

UNDER THE RUG WEBSITE

The website facilitates sharing examples of what creative failure looks like across a variety of domains.

① TAGGING
Examples can be tagged to facilitate finding something thematic, such as moonshot ideas or work from early on in one's career

② FEATURED EXAMPLES
Examples of creative failure with particularly interesting or insightful back stories can take the form of a longform article

CONCEPT # 4

creos

WHERE IT STARTED

This idea initially started off as a very simple physical wearable that a user would be able to interact with to record their emotional state as they move through the creative process.
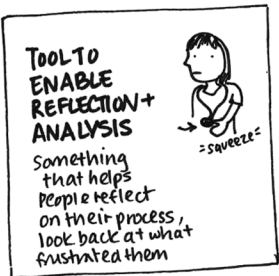
WHAT INFLUENCED IT

My Exploratory Research findings showed me that people don't always know they are engaging in the creative process or feel empowered about how to reach their creative potential. Furthermore, my literature review showed that emotions have a significant impact on creativity.

WHERE IT ENDED UP

In the end, this concept not only involved a simple wearable, but also data from sources such as: mobile phone motion sensor specialized apps for tracking data which would help provide a rich picture of the user's creative process.

HOW IT WORKS

MOBILE PHONE
- GPS logs location
- Emotional data from voice pitch
- Microphone logs ambient noise level
- Activity data (SMSs, Calls, app usage [e.g. to do lists]
- Creos' app logs responses to questions on emotional and creative state

COMPUTER
- Activity data like emails programs used

WEBCAM/MOTION SENSOR
- Emotional data from facial expressions and posture

WRISTBAND
- Sleep and physical activity can be logged
- Electrodermal and skin temperature sensors add nuance to emotional data

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TOOL TO ENABLE REFLECTION + ANALYSIS
Something that helps people reflect on their process, look back at what frustrated them

= squeeze =

WHAT IT IS

A system that tracks your emotions, productivity, and environmental context to help you gain insight into your own creative process.

SIMILAR IDEAS

affectiva
Affectiva.com

- This is a company founded by an MIT Media Lab professor Rosalind W. Picard which produces facial recognition software and the recently-discontinued Q sensor skin conductance wristband, both of which detect emotions

tacc THE AFFECTIVE COMPUTING COMPANY
theaffectivecomputingcompany.com

- A start-up in Pittsburgh that's looking at using mobile devices to measure and track people's subjective well-being

---

creos

dashboard my data insights community   Hi, Lisa.
settings | logout

Insights

What does your data really mean? How can you use it to be more creative and productive?

①

Where am I the most productive?

How is this measured?

Time Period: Last week ▾

What This Means
The bigger the icon, the more productive you were in that location.

Something to Ponder...
How well does your schedule allow you to flexibly switch where you're working?

Home - 1481 Walnut ☑

▶▶ Next card

More Information **②**
(1481 Walnut)   Source Data

Best time to be here	Noise level	Music?	Emotional State	Workload
7-9 pm	Pretty quiet	80s Rock See top playlists »	Worried	Swamped

Customize What I See

A user sees this screen when they have the Creos system and they click on Insights at the top navigation bar. This screen takes all the data gathered by the CREOS system and presents it in an easy-to-understand format.

① **INSIGHT CARDS**
The core part of the Insights page are the Insight cards. Each card includes a question, such as "Where am I the most productive?" or "When do I feel the most creative?" that can be answered with data collected by Creos.

② **SUPPORTING INFORMATION**
This area shows the supporting information that explains the nuances behind the insights (e.g. You are more productive at home between 12-2am with a low ambient noise level and some 80s rock.)

EVALUATIVE TESTING

Next, I created interactive prototypes for these design concepts, using the AxureRP rapid prototyping tool. This allowed me to create interactive prototypes that I could have users test. In addition, I also created the physical prototype for the Under the Rug concept in the cafe area of our Graduate Studio space.

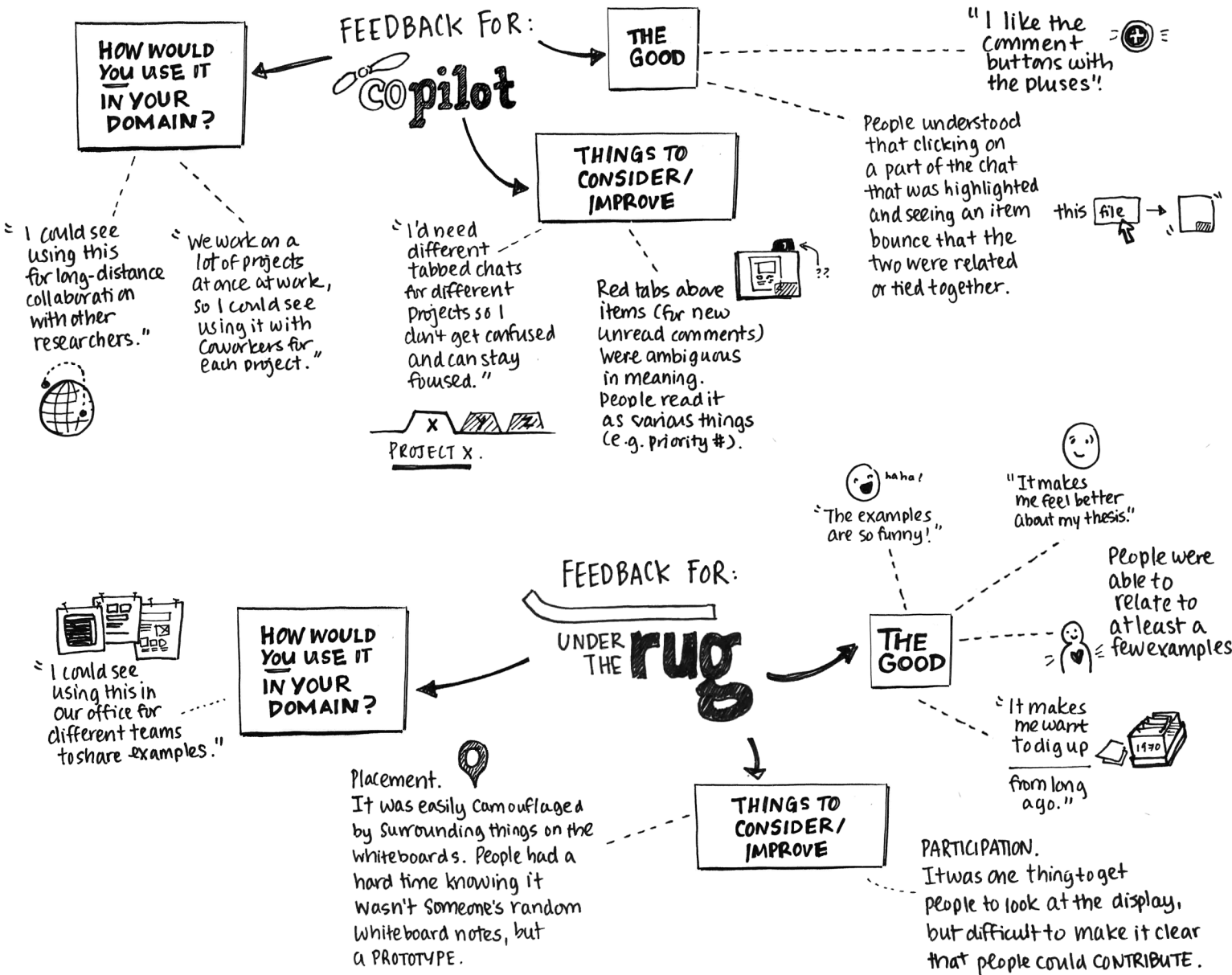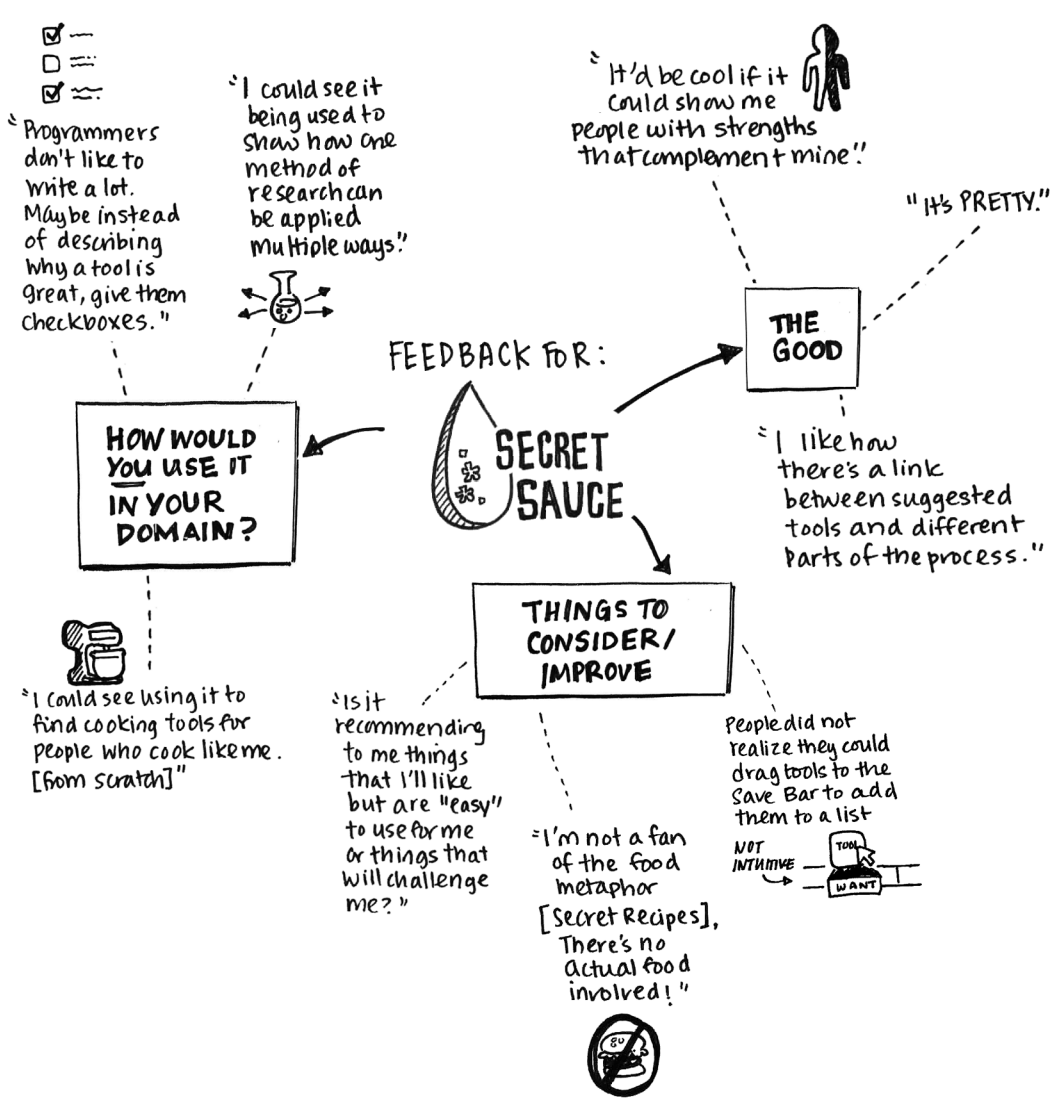I completed some basic evaluative testing with a small number of people. These sessions were informal, and I asked them for their impression of the prototype, how they thought certain features worked and how they might apply the concept to their own domains. Unfortunately, due to time constraints, the Creos concept was not evaluated; however, highlights from the informal testing I conducted is summarized here.

SECRET SAUCE

FEEDBACK FOR:

HOW WOULD YOU USE IT IN YOUR DOMAIN?

"Programmers don't like to write a lot. Maybe instead of describing why a tool is great, give them checkboxes."

"I could see it being used to show how one method of research can be applied multiple ways."

"It'd be cool if it could show me people with strengths that complement mine."

"It's PRETTY."

THE GOOD

"I like how there's a link between suggested tools and different parts of the process."

"I could see using it to find cooking tools for people who cook like me. [from scratch]"

THINGS TO CONSIDER/ IMPROVE

"Is it recommending to me things that I'll like but are "easy" to use for me or things that will challenge me?"

"I'm not a fan of the food metaphor [Secret Recipes], There's no actual food involved!"

People did not realize they could drag tools to the Save Bar to add them to a list

NOT INTUITIVE
TOOL I WANT

HOW WOULD YOU USE IT IN YOUR DOMAIN?

FEEDBACK FOR: **copilot**

"I could see using this for long-distance collaboration with other researchers."

"We work on a lot of projects at once at work, so I could see using it with coworkers for each project."

"I'd need different tabbed chats for different projects so I don't get confused and can stay focused."

THE GOOD

"I like the comment buttons with the pluses"!

People understood that clicking on a part of the chat that was highlighted and seeing an item bounce that the two were related or tied together.

this file

THINGS TO CONSIDER/ IMPROVE

Red tabs above items (for new unread comments) were ambiguous in meaning. People read it as various things (e.g. priority #).

PROJECT X.

HOW WOULD YOU USE IT IN YOUR DOMAIN?

FEEDBACK FOR: UNDER THE **rug**

"I could see using this in our office for different teams to share examples."

Placement. It was easily camouflaged by surrounding things on the whiteboards. People had a hard time knowing it wasn't someone's random whiteboard notes, but a PROTOTYPE.

THE GOOD

"The examples are so funny!"

"It makes me feel better about my thesis."

People were able to relate to at least a few examples

"It makes me want to dig up from long ago."

THINGS TO CONSIDER/ IMPROVE

PARTICIPATION. It was one thing to get people to look at the display, but difficult to make it clear that people could CONTRIBUTE.

PERSONAS AND SCENARIOS

To contextualize the design concepts, I developed three personas that represent prototypical users. I used the personas to develop three scenarios. The stories illustrate how the design concepts would fit into the context of the users' lives and describe features of the prototypes that they would likely find useful.

Meet SALLY, JOE, and CAMERON.

They met in college, and became great friends. Although they live in different cities now across the country, they enjoy helping each other tackle creative challenges and exploring innovative approaches to moving their ideas forward on their own...

➜ How do they do this? Let's find out:

SALLY
Design Graduate Student

LONG-TERM GOAL: Become a better designer, connect with other designers in the industry

SHORT-TERM GOALS: Wants to engage in a design challenge that will showcase her skills when interviewing for a job that she aims to start after graduation

- Still relatively new to her field, finds it frustrating to learn all the tools designers are expected to know
- She feels she's not quite as efficient in workflow as her peers — some who have a bit more experience

OPTIMIZE
EMPATHIZE
CONNECT
EMPOWER

↑
DESIGN THEME NEEDS

JOE
Junior Developer at a mid-size startup

LONG-TERM GOALS: Become a senior developer, launch his own startup as a Technical Founder in the future

SHORT-TERM GOALS: Wants to impress his new manager and coworkers, and get the code that he writes shipped

- Still settling into the company, Joe finds it a bit of a learning curve understanding the ins and outs of the company's processes
- Finds it tough sometimes writing code in such a collaborative environment

OPTIMIZE
EMPATHIZE
CONNECT
EMPOWER

CAMERON
Lab Manager at a university cellular biology lab

LONG-TERM GOALS: Apply for a PhD program next year, improve his overall creative process

SHORT-TERM GOALS: Produce a good research poster for an upcoming conference, get his resume revamped

- Self-described "data geek", Cameron likes to use various apps and technologies to track different aspects of his life
- Balances irregular hours in the lab performing experiments and writing papers with hanging out with his friends
- Does not consider himself very creative, since he feels the ideas for his experiments come from his P.I. (Principal Investigator)

OPTIMIZE
EMPATHIZE
CONNECT
EMPOWER

SALLY: A SCENARIO

1. Sally needs to redesign a banking website as part of a design assignment for an interview. She gets on COPILOT and brainstorms with her friends, and specifically asks for Joe's opinion since he has a bank account there.


2. She creates a wireframe sketch, and her friends Joe and Cameron give her same feedback and encouragement along the way. Cameron comments via COPILOT that it would be good to have an image of someone at the bank on the main page.
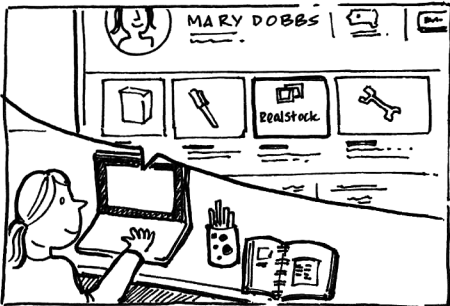
3. She realizes she needs some stock photos for the design. She uses SECRET SAUCE to see where her classmates and other designers she admires get their stock photos. She sees that one of her classmates recommends Realstock, a site that has good, realistic photos.
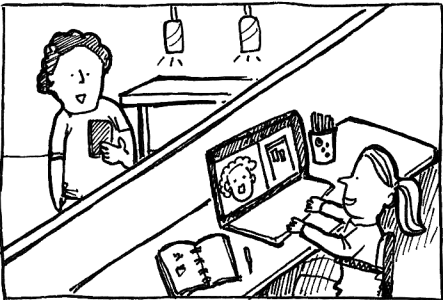

4. After completing her design, she uploads another version on COPILOT. She gets on video chat for a bit with Joe to ask whether a few parts of her design are feasible for development.
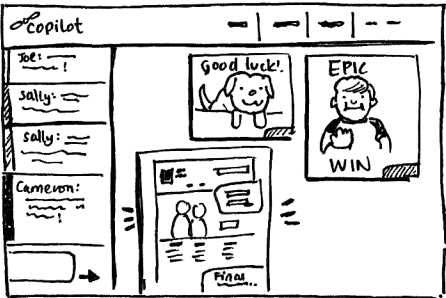
5. She finishes the final touches for her design a few hours before her flight. She sees that both Joe and Cameron have left her funny images basically wishing her good luck. She smiles, and gets ready to pack.

JOE: A SCENARIO
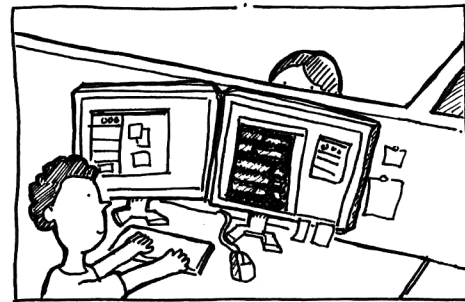
1. Joe spends the morning chatting a bit and brainstorming with Sally. He talks about how he's nervous about his first code review—which will be in a few hours. He spends the rest of his time adding some last-minute annotations to his code.

2. His code review—with his manager and another senior developer—turns out to be quite rough. They ask him questions he had never even considered, and they pointed out various areas in his code which could've been simplified.
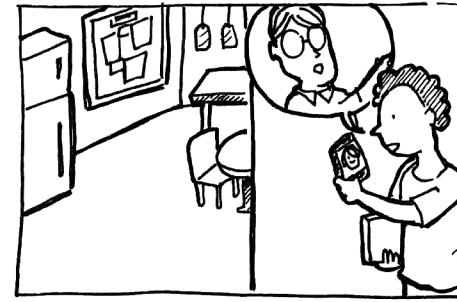
3. Joe leaves the meeting feeling a little discouraged—his ego is a little bruised. He talks about it on video chat through COPILOT while answering some of Sally's questions. On his way back to his desk, he notices a pinboard in the kitchen area.

4. Joe goes over to take a closer look. His coworker Lee explains that it's the company "UNDER THE RUG" board, where people are invited to post up various examples of failure. Lee points out the code snippet that Joe's manager had turned in for his first review, and the two have a good laugh. He comments by putting a sticker on the example: "SUPER elegant."

5. Joe feels a bit better, realizing that even his manager had been in his same position. He gets on COPILOT quickly to wish Sally good luck and to download Cameron's resume onto his computer for proofreading later. He returns to his desk, to prepare a plan for revising his code.
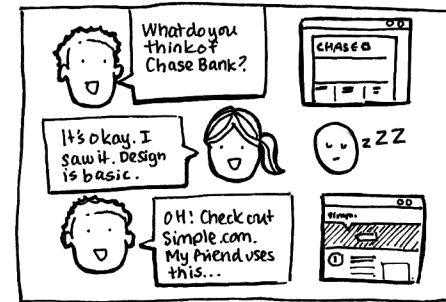
CAMERON: A SCENARIO

1. Cameron, preparing for a conference next month, uploads a draft of his research poster to COPILOT for feedback, along with his resume for proof reading.


2. With a few hours to go until he needs to start the next step of his experiment, he chats for a while with Sally, brainstorming other good banking websites that may serve as inspiration for her redesign.


3. In the middle of the day, Cameron gets a message from the CREOS system, which he has started using to track various aspects of his creativity and productivity, such as how he's feeling during the process. Since he's been working on his research paper without really moving forward, he texts back a "3" (out of 10).
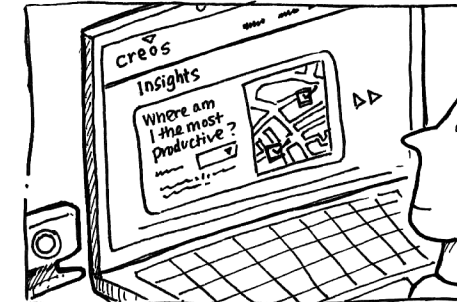
4. He checks out his CREOS profile online and flips through some of the Insights cards. He sees that based on his data last month, he's been more productive at home at this hour, so he decides to go home to continue his writing.
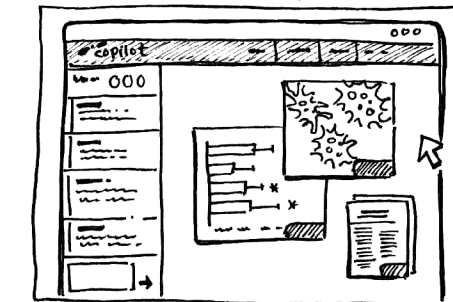

5. Later on that evening, he gets on COPILOT to discuss some findings with colleagues in another state.
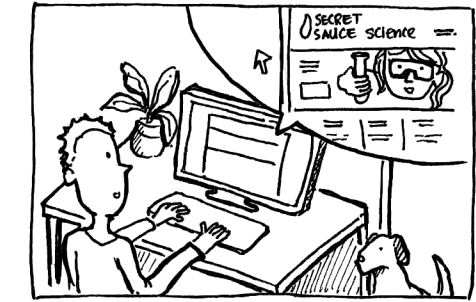
6. His colleagues tell him about SECRET SAUCE's beta site for sharing protocols between scientists. He finds it a useful tool for exploring extensions to the cell culture technique he's been using. Later in the evening, CREOS asks how creative he's feeling again, and this time he texts a "5". He wishes Sally good luck on her interview, and returns to the lab to check up on an experiment.

WHEN WERE THE CONCEPTS USED?

This chart summarizes / shows when Sally, Joe, and Cameron used each of the 4 design concepts throughout the day:
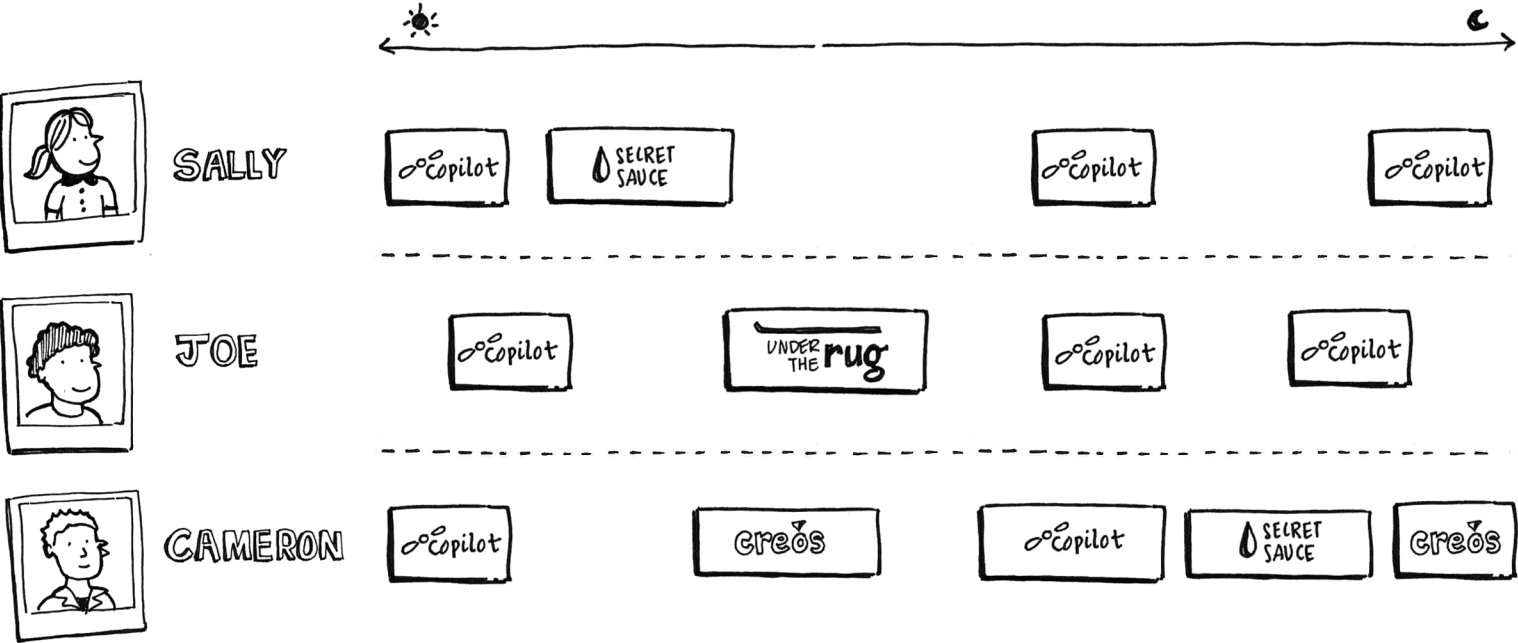
CONCLUSION

I had originally defined the success of this project as creating something that resonated with people and improved their development of creative ideas. These characteristics translated into project goals, which I believe I achieved based on the positive feedback that I received from participants during various testing sessions. Nonetheless, I can envision the project extending beyond my initial thesis. In order to improve the fit of the tools for various domains, I would conduct more formal testing of the prototypes, paying close attention to usability issues. In addition, I would conduct more in-depth ethnographic research so I can fine-tune concepts and make them truly work well for people in specialized domains.

Another success of this project is its design framing, which encourages and provokes people into thinking about creativity not as something that has a "quick-fix" solution but as something personal and deeply important. By considering the messy realities of the creative process (such as instances of failure, chaos, and confusion), I hope that people become liberated to search for and reach their creative potential.

In the coming years, creativity and innovation will be an increasingly important topic that will most certainly warrant more attention and study. With ever-evolving technologies in neuroscience, artificial intelligence and machine learning, it's exciting to think about what the creative process will look like in the next decade. One thing I feel fairly confident about is that despite the new technologies that will insert themselves into our lives in the future, the confusion, chaos and periods of uncertainty that is part and parcel of the creative process will not be going away any time soon. And I think that is a good thing—because it means that we will continue to have opportunities to challenge ourselves and grow through the act of creating things that better ourselves and society.

REFLECTION

Reflecting back, this thesis project has been a long and emotionally difficult journey. At times, I doubted why I even decided to take on such an ambiguous to study. I think one of the biggest challenges I faced in this project was believing in the validity of the project topic itself. There were many times when I felt embarrassed or scared to talk about the project, because creativity as a topic is so complex and broad. Everyone had an opinion on it, because we are all practitioners of the creative process, which means that there are just so many more chances that your ideas will conflict with their understanding of creativity. In the end, I'm glad I persevered through this challenge, because I wouldn't have ended up with my final design themes and framing had I chosen to look at creativity more narrowly or confined myself to studying one specific stage (e.g. just the idea generation stage).

In a way, it's ironic that this project itself is one that has utilized the creative process, and I can't help thinking how often the need for the design themes appeared in the process of completing this project. For example, as I was contacting people for examples to place on my prototype for Under the Rug, I felt nervous that my idea would be rejected (particularly by well-established professionals in the industry), and the entire concept would fail. Yet, the whole basis for the concept was to provide a space for people to discuss and share their failures. Talk about irony! In the end though, this project has made me more cognizant of the inherent highs and lows of the creative process, so that in the future, when I encounter a block or a setback, I will be able to accept it more easily as an opportunity to grow. It's still not easy to do this, but this project has been a major stepping stone in the development and maturation of my own creative process.

REFERENCES

1. Adams, J. L. (1986). Conceptual blockbusting: a guide to better ideas (3rd ed.). Reading, Mass.: Addison-Wesley.

2. Amabile, T., Barsade, S., Mueller, J., & Staw, B. (2005). Affect and Creativity at Work. Administrative Science Quarterly, 50(3), 367-403.

3. Carson, S. (2010). Your creative brain: seven steps to maximize imagination, productivity, and innovation in your life. San Francisco: Jossey-Bass.

4. Csikszentmihalyi, M. (1996). Creativity: flow and the psychology of discovery and invention. New York: HarperCollinsPublishers.

5. Evenson, S. (2006). Directed Storytelling: Interpreting Experience for Design. Design studies: theory and research in graphic design (pp. 231-240). New York: Princeton Architectural Press.

6. Finke, R. A., & Ward, T. B. (1996). Creative cognition theory, research, and applications. Cambridge, Mass.: MIT Press.

7. Haque, U. (n.d.). Let's Save Great Ideas from the Ideas Industry - Umair Haque - Harvard Business Review. HBR Blog Network - Harvard Business Review. Retrieved March 18, 2013, from http://blogs.hbr.org/haque/2013/03/lets_save_great_ideas_from_the.html

8. Johnson, S. (2010). Where good ideas come from: the natural history of innovation. New York: Riverhead Books.

9. Kolko, J. (2011). Exposing the magic of design: a practitioner's guide to the methods and theory of synthesis. New York: Oxford University Press.

10. Markman, A. B. (2012). Smart thinking: three essential keys to solve problems, innovate, and get

things done. New York: Perigee.

11. Pink, D. H. (2006). A whole new mind: why right-brainers will rule the future. New York: Riverhead Books.

12. Rhodes, M. (1961, April). Analysis of Creativity. Phi Delta Kappan, 42, 305-310.

13. Russ, S. W. (1993). Affect and creativity: the role of affect and play in the creative process. Hillsdale, N.J.: L. Erlbaum Associates.

14. Sawyer, R. K. (2006). Explaining creativity: the science of human innovation. Oxford: Oxford University Press.

15. Sternberg, R. J. (1998). Enhancing Creativity. Handbook of creativity (pp. 392-431). Cambridge, U.K.: Cambridge University Press.

16. Wallas, G. (1926). The art of thought,. New York: Harcourt, Brace and Company.

17. Zabelina, D., & Robinson, M. (2010). Creativity as flexible cognitive control.. Psychology of Aesthetics, Creativity, and the Arts, 4(3), 136-143.

18. Zhou, J., & George, J. (2001). When Job Dissatisfaction Leads to Creativity: Encouraging the Expression of Voice. The Academy of Management Journal, 44(4), 682-696.