

BRAINSTORMING,
IDEATION, AND
DESIGN

Elijah Wiegmann

Founder Base Design Studio
4moms Design Director
Michael Graves Design Group



WHAT IS
"DESIGN THINKING" ?



UNCERTAINTY

research

prototype



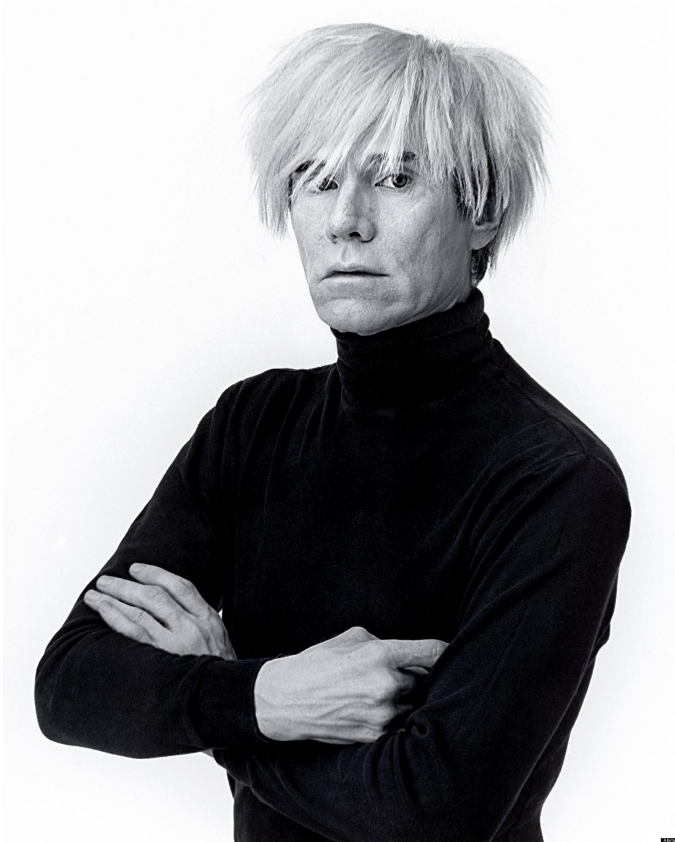
FOCUS

design



DESIGNERS LIKE AMBIGUITY

WE'RE SENSITIVE ARTISTS



WE'RE SENSITIVE ARTISTS

“That Blue isn't blue enough”

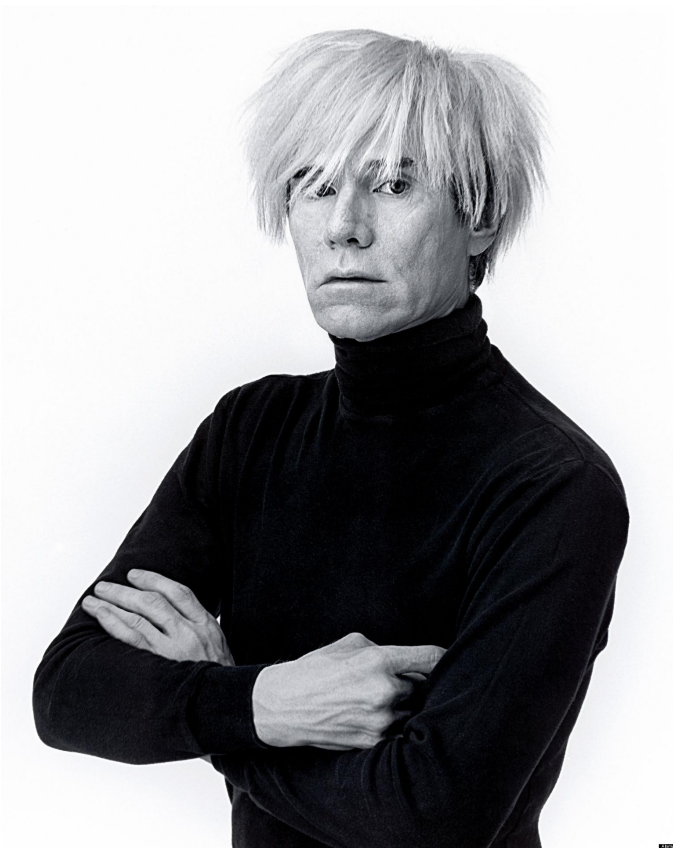
It's actually a bit more Cerulean than Teal

“What if it wasn't?”

Blow it up! Get it out of my face!

“Does it have to be like that?”

I just, like... don't get it



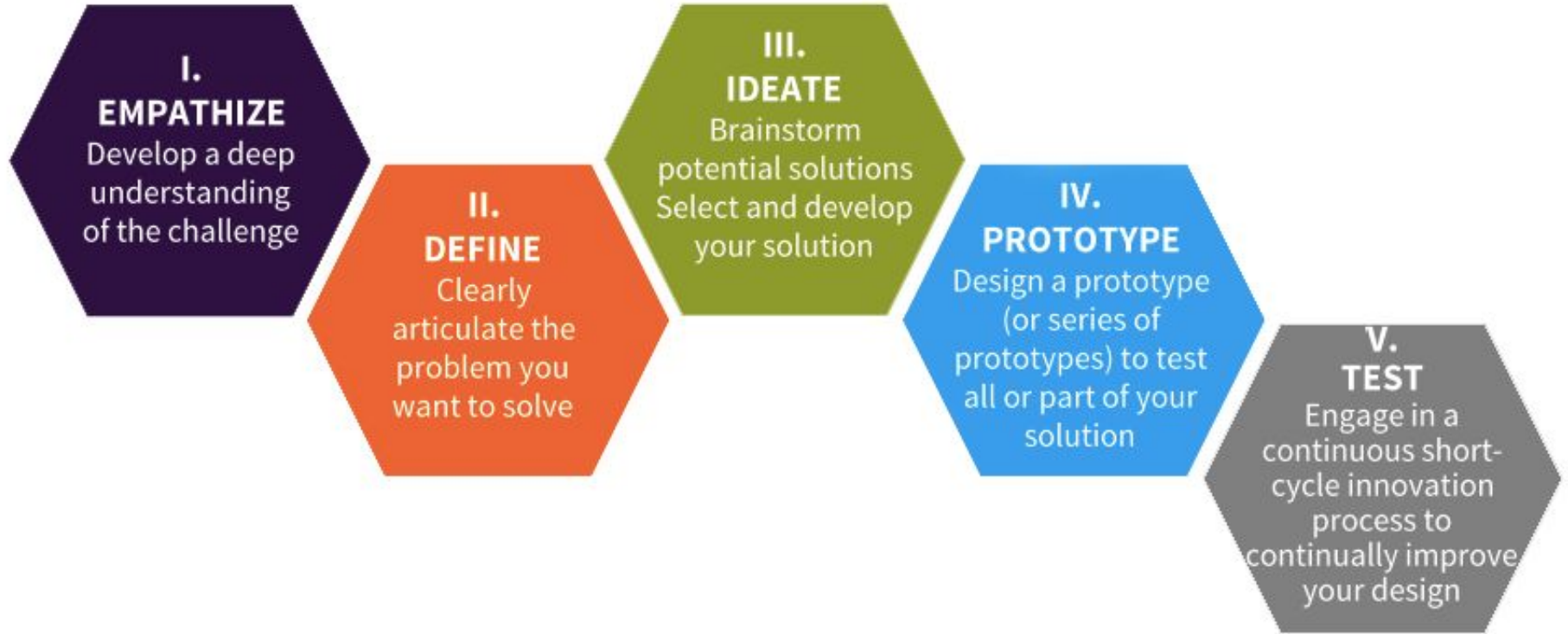
BUT WE'RE ALSO CANARIES

This is the part where you get sensitive...

Have you actually tested?
Do you want the truth?
Are your costs in-line?
What's it made out of?
Who can help us?
Does it work?
Does anyone even want it?



THE PROCESS



WHAT IF ... ?

QUESTION/HYPOTHESIS

TEST QUICKLY





ITERATE

A hand is holding a camera lens in the foreground, with the lens's opening acting as a frame for a scenic view of a lake and mountains. The background is a blurred landscape with a blue sky and green hills. The word 'FOCUS' is written in a white box in the bottom left corner.

FOCUS

EXERCISES

QUESTION/HYPOTHESIS

STORYBOARDING

CONNECTIONS

S.C.A.M.P.E.R

ZERO DRAFT

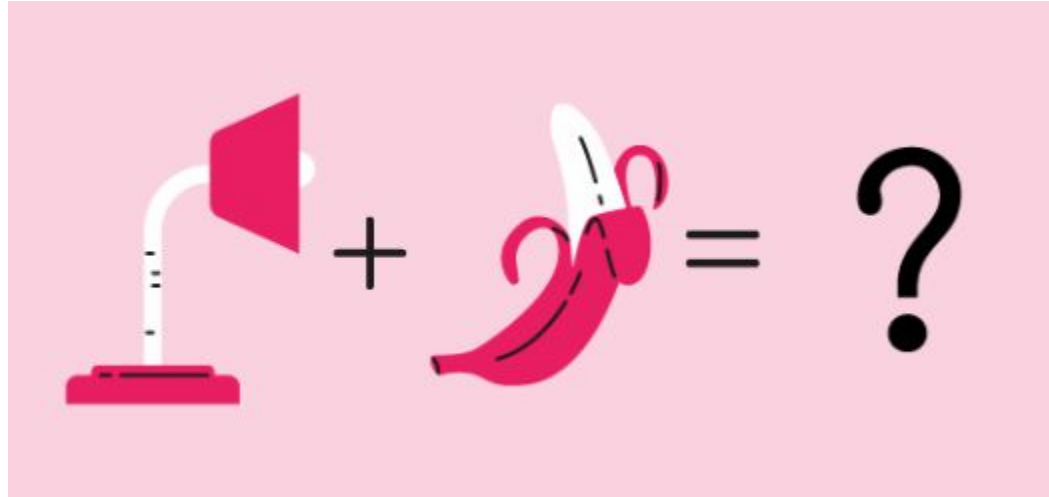
QUESTION/HYPOTHESIS

**THAT MAKES ME
THINK OF...**

WISHING

BRAIN WRITING

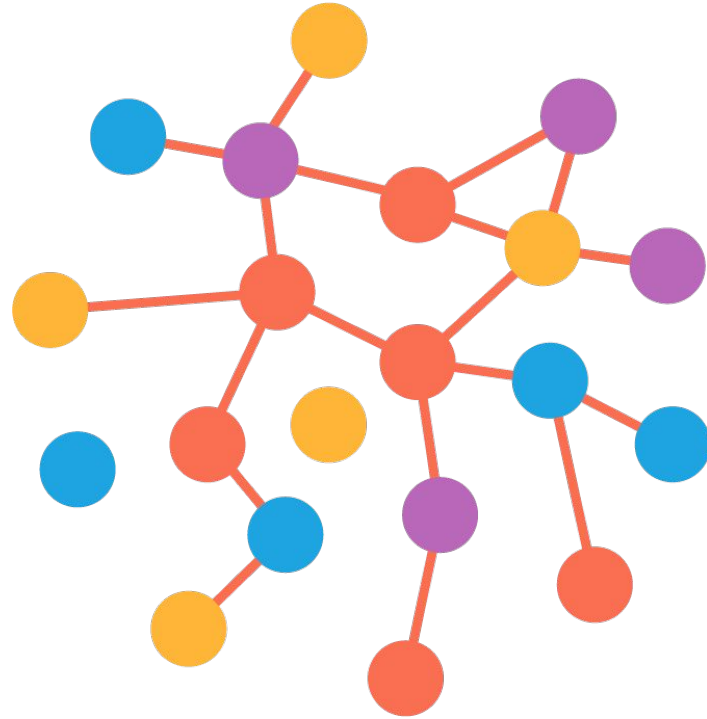
CONNECTIONS



QUESTION/HYPOTHESIS

<https://blog.hubspot.com/marketing/creative-exercises-better-than-brainstorming>

THAT MAKES ME THINK OF...



QUESTION/HYPOTHESIS

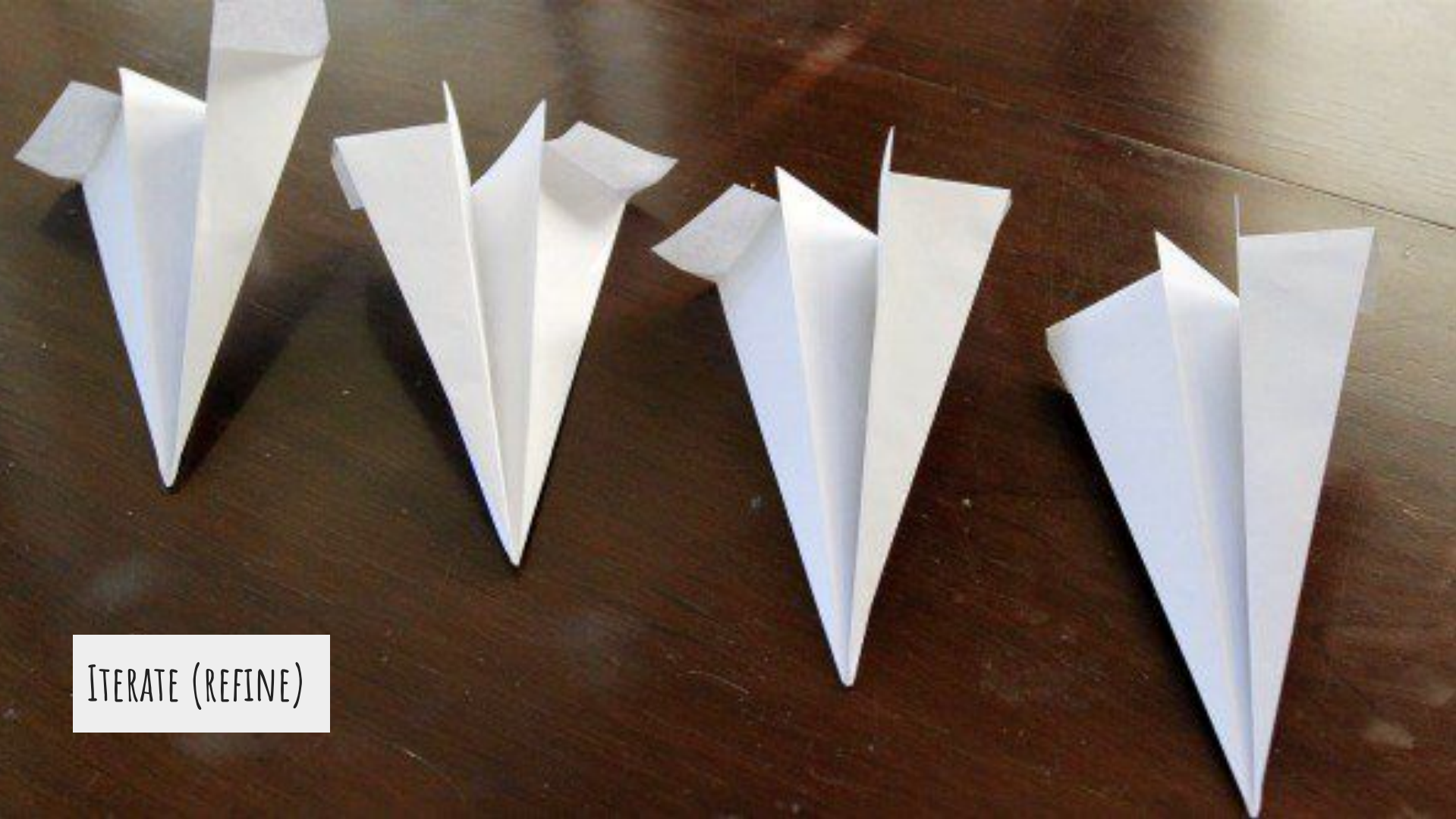
WISHING...

IT WOULD BE SO MUCH EASIER IF WE DIDN'T
HAVE TO WORRY ABOUT (X)...

QUESTION/HYPOTHESIS



TEST QUICKLY



ITERATE (REFINE)



FOCUS

KNOWING
THE
CONSTRAINTS!

CHARLES
EAMES





"HERE IS ONE OF THE FEW EFFECTIVE KEYS TO THE DESIGN PROBLEM — THE ABILITY OF THE DESIGNER TO RECOGNIZE AS MANY OF THE CONSTRAINTS AS POSSIBLE — HIS WILLINGNESS AND ENTHUSIASM FOR WORKING WITHIN THESE CONSTRAINTS. CONSTRAINTS OF PRICE, OF SIZE, OF STRENGTH, OF BALANCE, OF SURFACE, OF TIME AND SO FORTH."

—CHARLES EAMES



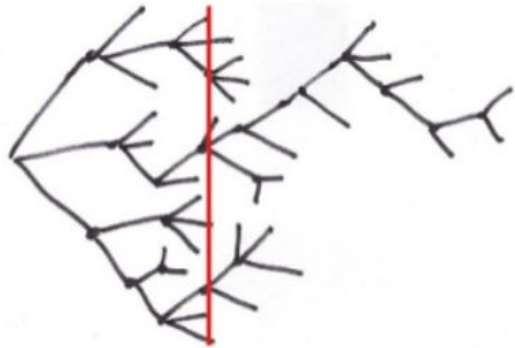
STUDY THE CONSTRAINTS...
(AND TELL THEM TO
EVERYONE)



PROTOTYPING TO SORT, ORGANIZE AND FILTER

Without prototyping, you can't make an educated choice about which ideas to pursue. The purpose of any prototype is to test a concept before committing time and resources.

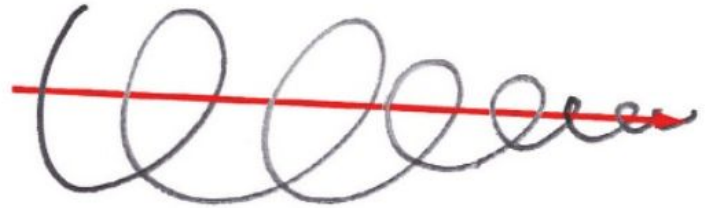
WHY PROTOTYPE?



Design

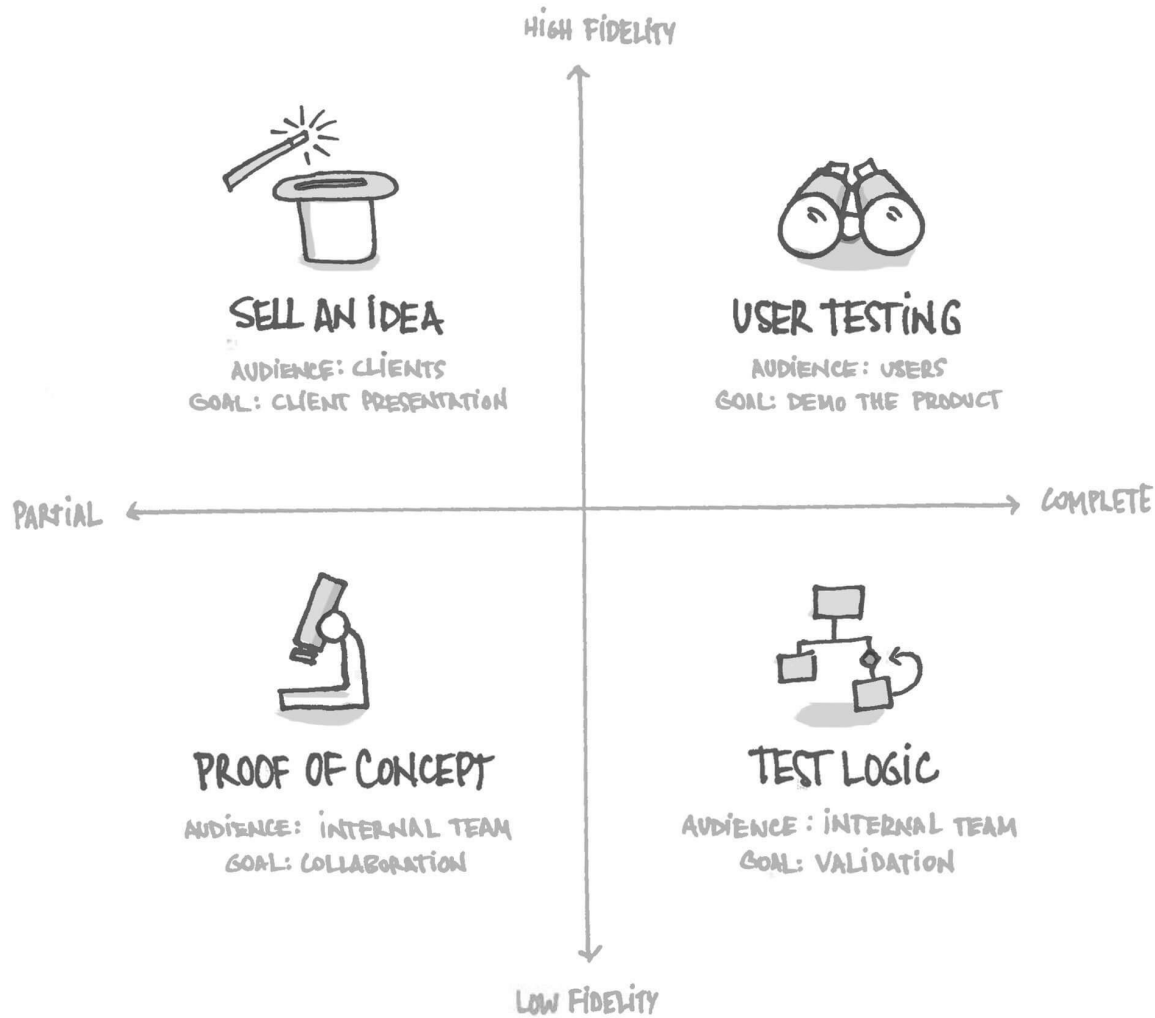
“Branching Exploration”

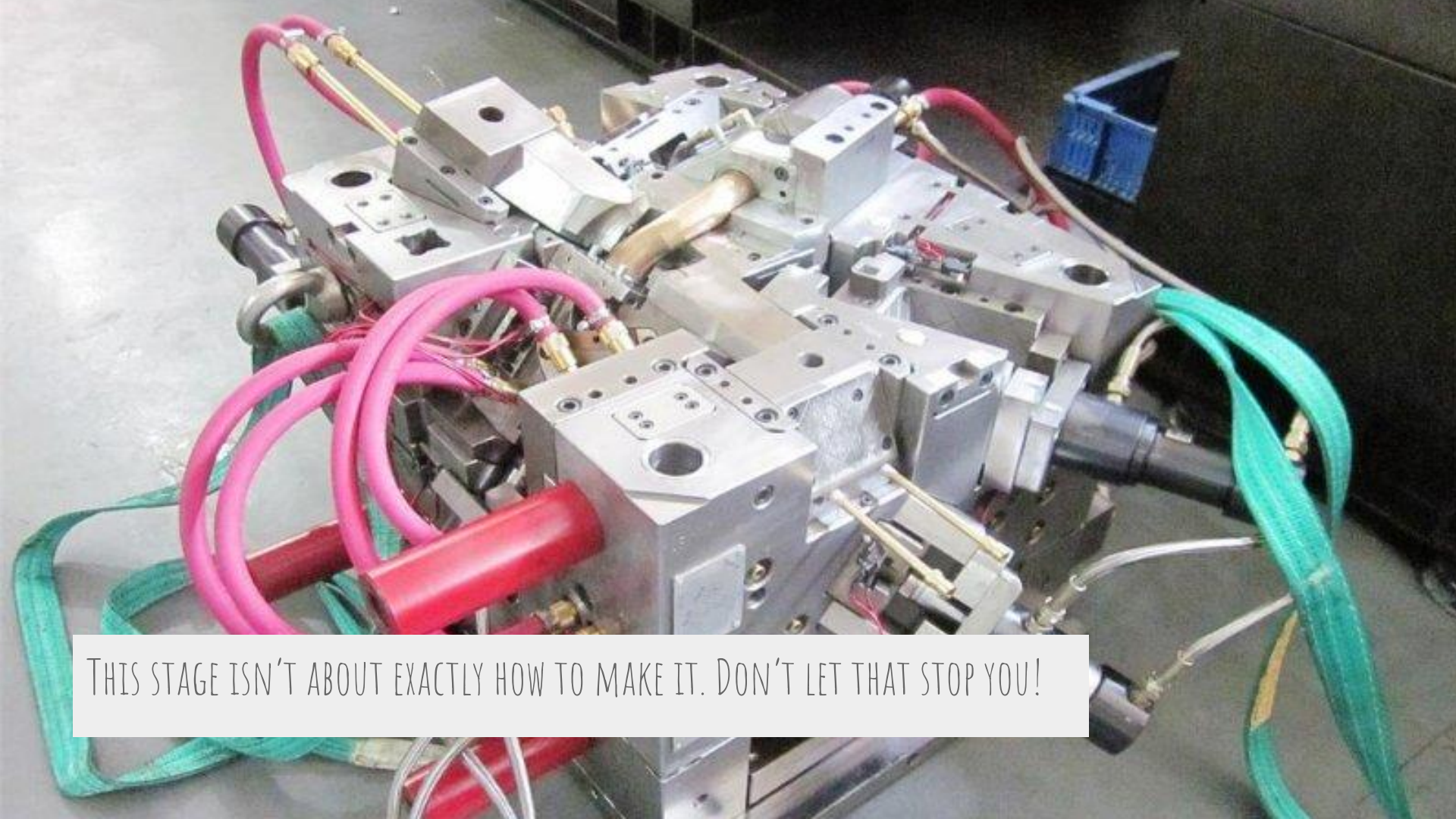
v



Prototyping

“Incremental iterative refinement”





THIS STAGE ISN'T ABOUT EXACTLY HOW TO MAKE IT. DON'T LET THAT STOP YOU!

THE BEST OVERVIEW OF PROTOTYPES EVER



iD Cards- Loughborough
University, 2009

Download the pdf and app

[http://www.lboro.ac.uk/media/wwwlboroacuk/external/content/schoolsanddepartments/designschool/downloads/id-cards%20\(1\).pdf](http://www.lboro.ac.uk/media/wwwlboroacuk/external/content/schoolsanddepartments/designschool/downloads/id-cards%20(1).pdf)

Concept

1 Idea Sketch

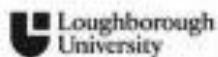


Development

Embodiment

Detail

Employed at a personal level to quickly externalise thoughts using simple line-work. Also known as a Thumbnail, Thinking or Napkin Sketch.



Design Intent

Concept

2 Study Sketch

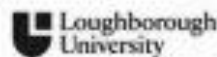


Development

Embodiment

Detail

Used to investigate appearance, proportion and scale in greater detail than an Idea Sketch. Often supported by the loose application of tone/colour.



Form

Concept

3 Referential Sketch

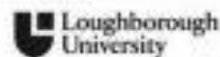


Development

Embodiment

Detail

Used to record images of products, objects, living creatures or any relevant observations for future reference or as a metaphor.



Visual Character

Concept

4 Memory Sketch

Concept

5 Coded Sketch

Concept

6 Information Sketch

Concept

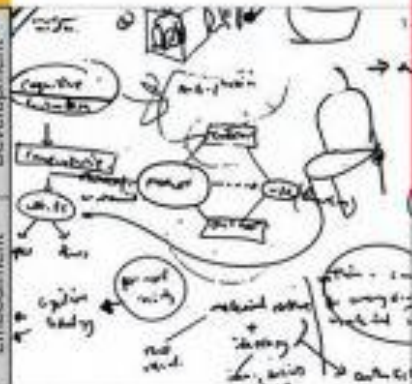
4 Memory Sketch

Scenario of Use

Development

Embodiment

Detail



Helps expand thoughts during the design process using mind maps, notes and annotations.

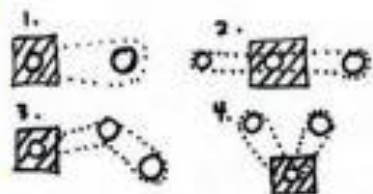
Concept

5 Coded Sketch

Development

Embodiment

Detail



Symbols: gear belt
 motor

Informal coded representation that categorises information to demonstrate an underlying principle or scheme.

Concept

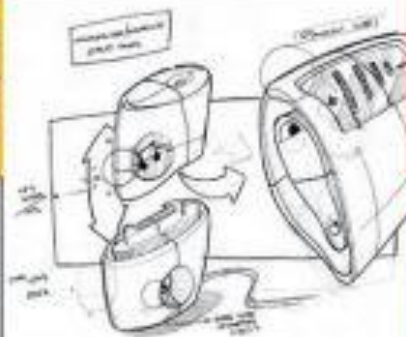
6 Information Sketch

Design Intent

Development

Embodiment

Detail



Quickly and effectively communicates features through the use of annotation and supporting graphics. Also known as an Explanatory or Talking Sketch.

Sketches

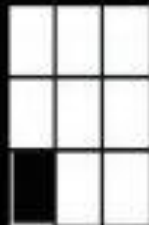
Concept

7 Sketch

Concept

8 Prescriptive

Sketches



iD
CARDS

Concept

7 Sketch Rendering

Development



Embodiment

Detail

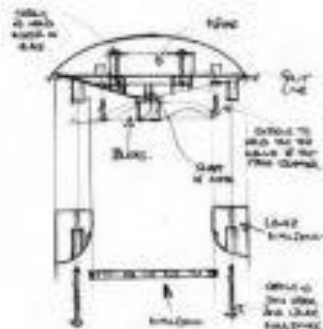
Clearly defined proposal produced by controlled sketching and use of colour/ tone to enhance detail and realism. Also known as a First Concept.

Form

Concept

8 Prescriptive Sketch

Development



Embodiment

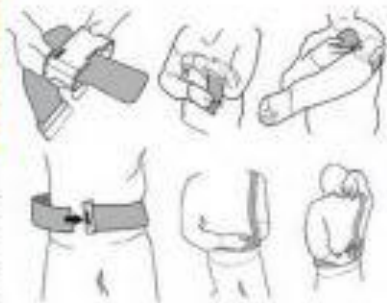
Detail

Informal sketch for the exploration of technical details such as mechanisms, manufacturing, materials and dimensions.

Concept

9 Scenario & Storyboard

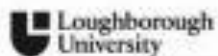
Development



Embodiment

Detail

Describes interaction between user and product, sometimes in an appropriate context.



Scenario of Use

Concept

10 Layout Rendering

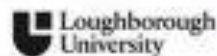
Development



Embodiment

Detail

Defines the product proposal as a third angle orthographic projection with precise line and colour.

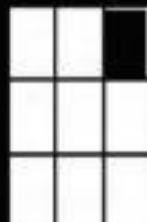


Form

+

Components

Drawings



Concept

11

Representation

Concept

12

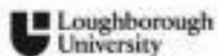
Representation

Concept

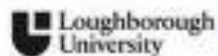
13

Representation

Data



Data



ID CARDS

Concept

11 Presentation Rendering

Development

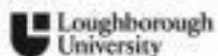


Form

Embodiment

Detail

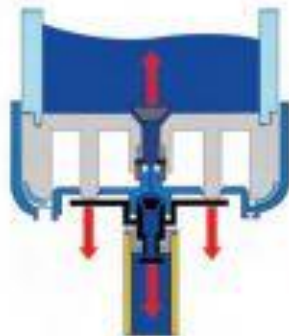
Contains a high level of realism to fully define product appearance as a perspective view. Particularly useful for decision making by non-designers.



Concept

12 Diagram

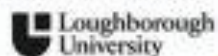
Development



Embodiment

Detail

Schematic representation of the operating principle or relationship between components. Also known as a Schematic or Diagrammatic Drawing.



Components

Concept

13 Perspective Drawing

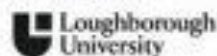
Development



Embodiment

Detail

Descriptive three-quarter view produced using a perspective drawing technique. Created using line only without the application of colour or tone.



Form

Concept

14 General Arrangement

Concept

15 Detail

Concept

16 Technical

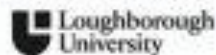
Detail

perspective view. Particularly useful for decision making by non-designers.



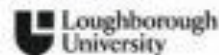
Detail

between components. Also known as a Schematic or Diagrammatic Drawing.



Detail

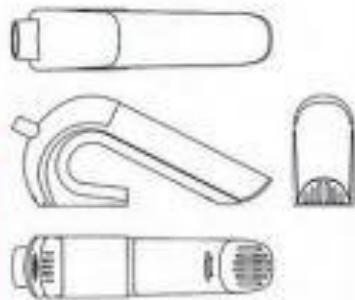
Created using line only without the application of colour or tone.



Concept

14 General Arrangement Drawing

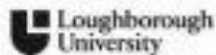
Development



Embodiment

Detail

Exterior view of all components using line only and with sufficient detail to produce an Appearance Model if required. Usually drawn in third angle projection.

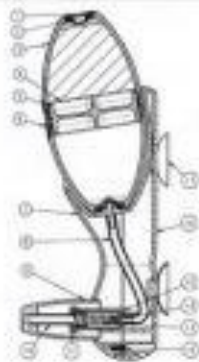


Components

Concept

15 Detail Drawing

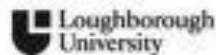
Development



Embodiment

Detail

Contains detail of components for the manufactured product. Also known as a Technical, Production or Construction Drawing.



Dimensions

Concept

16 Technical Illustration

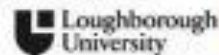
Development



Embodiment

Detail

Communicates technical detail with a high degree of realism that is sometimes supported with symbols. Includes exploded views.



Components

Models




iD
CARDS

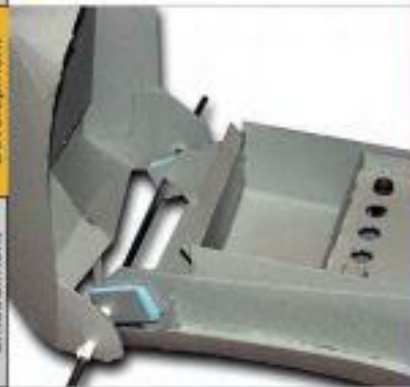
17 Sketch Model




Informal, relatively low definition 3D model that captures the key characteristics of form. Also known as a Foam Model or 3D Sketch.

 Loughborough
University

18 Design Development Model



Simple mock-up used to explore and visualise the relationships between components, cavities, interfaces and structures. Usually produced using card.

 Loughborough
University

19 Functional

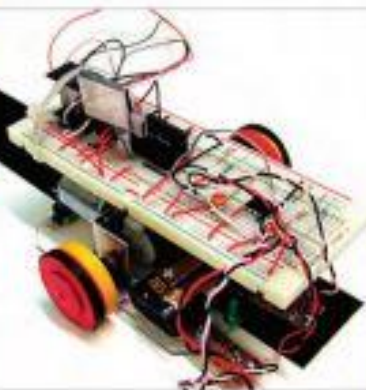
20 Operational

21 Appearance

Concept

19 Functional Model

Development



Embodiment

Detail

Captures the key functional features and underlying operating principles. Has limited or no association with the product's final appearance.

Performance

Concept

20 Operational Model

Development



Embodiment

Detail

Communicates how the product is used with the potential for ergonomic evaluation.

Usability & Operation

Concept

21 Appearance Model

Development



Embodiment

Detail

Accurate physical representation of product appearance. Also known as a Block Model as it tends not to contain any working parts.

Form

Concept

22 Assembly

Concept

23 Production

Concept

24 Service

Concept

22 Assembly Model

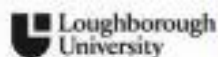
Development

Embodiment



Detail

Enables the evaluation and development of the methods and tools required to assemble product components.



Assembly

Concept

23 Production Model

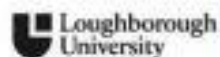
Development

Embodiment



Detail

Used to evaluate and develop the location and fit of individual components and sub-assemblies.



Construction

Concept

24 Service Model

Development

Embodiment



Detail

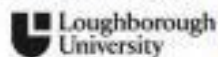
Supports the development and demonstration of how a product is serviced and maintained.



Assembly

Detail

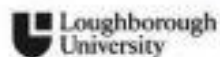
and underlying operating principles. Has limited or no association with the product's final appearance.



Per

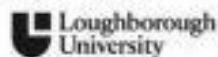
Detail

used with the potential for ergonomic evaluation.



Detail

product appearance. Also known as a Block Model as it tends not to contain any working parts.



Concept

25 Experimental Prototype

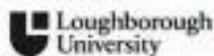
Development



Embodiment

Detail

Refined prototype that accurately models physical components to enable the collection of performance data for further development.



Performance

Concept

26 Alpha Prototype

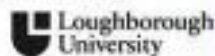
Development



Embodiment

Detail

Brings together key elements of appearance and functionality for the first time. Uses or simulates production materials.



Construction

Concept

27 Beta Prototype

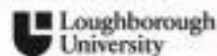
Development



Embodiment

Detail

A refined evolution of an Alpha Prototype used to evaluate on-going design changes in preparation for the final specification of all components.

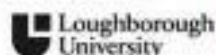


Construction

Usability & Operation

Detail

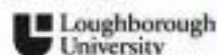
models physical components to enable the collection of performance data for further development.



Per

Detail

appearance and functionality for the first time. Uses or simulates production materials,



Co

Detail

used to evaluate on-going design changes in preparation for the final specification of all components.



Co

Concept

28 System Prototype

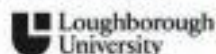
Development



Embodiment

Detail

Integrates components specified for the production item without consideration of appearance. Used to evaluate electronic and mechanical performance.



Performance

Concept

29 Final Hardware Prototype

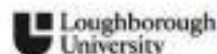
Development



Embodiment

Detail

Developed from the System Prototype as a final representation of the product's functional elements.



Performance

Concept

30 Off-Tool Component

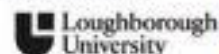
Development



Embodiment

Detail

Produced using the tooling and materials intended for production to enable the evaluation of material properties and appearance of components.



Materials

Concept

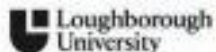
31

Concept

32

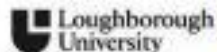
Detail

appearance, ergonomics and mechanical performance.



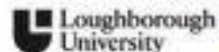
Detail

product's functional elements.



Detail

evaluation of the appearance of components.



Concept

31 Appearance Prototype

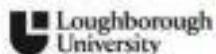
Development



Embodiment

Detail

Highly detailed representation that combines functionality with exact product appearance. Uses or simulates production materials.



←

Design Intent

↕

Performance

Concept

32 Pre-Production Prototype

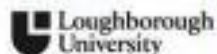
Development



Embodiment

Detail

Final prototype produced using production components. Manufactured in small volumes for testing prior to full scale production.



↑

Performance

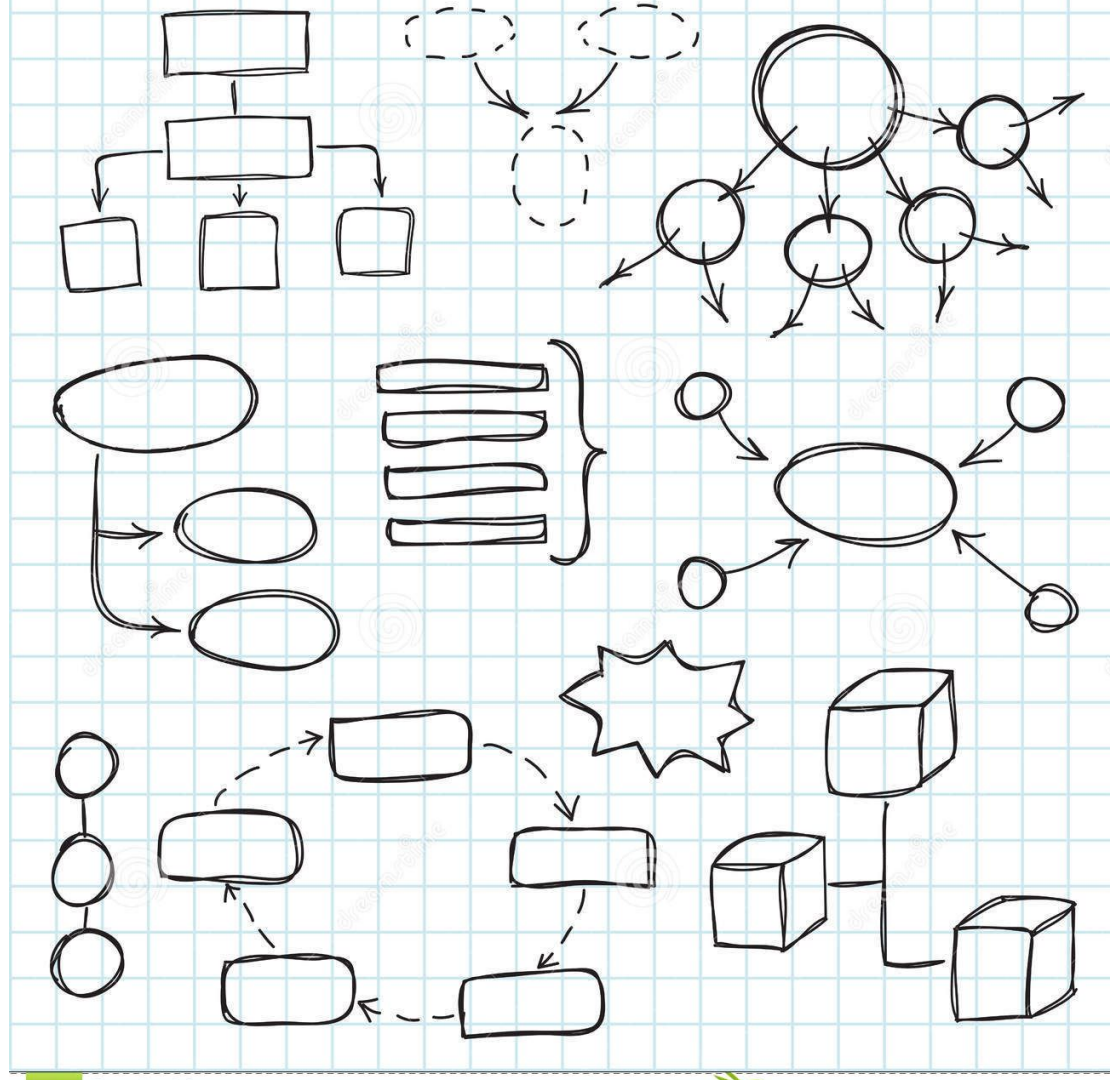
Prototypes



DRAWING

START DRAWING

MIND MAPS, FLOW CHARTS, IDEA
SKETCHES,



PHYSICAL PROTOTYPES

BUILD IT (CRAFT TIME)



OFF-THE-SHELF

Item Type	Dimensions	Price
Hex Nut	5/16" x 1-1/2"	70¢
Hex Nut	1/4"	26¢
Carriage Bolt	1/4" x 1"	63¢
Carriage Bolt	1/4" x 1-1/2"	71¢
Carriage Bolt	5/16" x 1"	90¢
Carriage Bolt	5/16" x 2"	\$1.05
Lag Screw	1/4" x 1"	56¢
Lag Screw	5/16" x 2"	\$1.36
Lag Screw	3/8" x 1-1/2"	\$1.40
Eye Bolt	1/4" x 4"	48¢
Hex Nut	5/16" x 2"	\$1.50
Hex Nut	3/8" x 1"	64¢
Hex Nut	5/16"	32¢
Carriage Bolt	1/4" x 2"	80¢
Carriage Bolt	1/4" x 3"	\$1.21
Carriage Bolt	5/16" x 3"	\$1.40
Lag Screw	1/4" x 1-1/2"	74¢
Lag Screw	5/16" x 2-1/2"	\$1.70
Lag Screw	5/16" x 3"	\$1.42
Lag Screw	3/8" x 2"	\$1.76
Eye Bolt with Nut	5/16" x 4"	70¢
Hex Nut	5/16" x 2-1/2"	\$1.25
Hex Nut	3/8" x 2"	\$1.25
Hex Nut	3/8"	43¢
Carriage Bolt	1/4" x 4"	\$1.40
Carriage Bolt	3/8" x 1"	\$1.02
Carriage Bolt	3/8" x 2"	\$1.27
Lag Screw	1/4" x 2"	92¢
Lag Screw	5/16" x 3-1/2"	\$2.13
Lag Screw	5/16" x 4"	\$2.45
Lag Screw	3/8" x 3"	\$2.23
Eye Bolt with Nut	5/16" x 4"	98¢
Eye Bolt with Nut	3/8" x 6"	\$1.11
Hex Nut	3/8"	25¢
Hex Nut	3/8" x 5"	\$3.50
Hex Nut	3/8" x 6"	\$4.21
Hex Nut	1/2"	\$5.10
Lag Screw	1/4" x 2-1/2"	\$1.10
Lag Screw	1/4" x 3"	\$1.21
Lag Screw	3/8" x 4"	\$3.00
Lag Screw	3/8" x 5"	\$3.21
Lag Screw	3/8" x 6"	\$3.54
Eye Bolt with Nut	1/2" x 6"	\$2.40
Eye Bolt with Nut	1/2" x 8"	\$2.71

BUY THINGS THAT ARE
SIMILAR AND TAKE
THEM APART!

CARDBOARD

PAPER, TAPE, STAPLES, SCISSORS



SCULPEY, CLAY, PLAY-DOH

MODEL THE WHOLE SHAPE, OR JUST USE
TO REFINE CURVES





THEY EVEN DESIGN CARS IN CLAY!

FOAM

GREEN OR PINK FOAM INSULATION AT
HOME DEPOT

HIGH DENSITY CARVING FOAM



SOFTGOODS PROTOTYPING

PAPER, TAPE, STAPLES, SCISSORS



SOFTGOODS PROTOTYPING

FABRIC

IF YOU CAN'T SEW, USE STAPLES OR TAPE



NEXT LEVEL
PROTOTYPES

CAD MODEL

COMPUTER ASSISTED DESIGN

SOLIDWORKS, PRO E, RHINO

50 HRS + SPECIALIZED EXPERTISE



COMPUTER RENDERINGS

PHOTOREALISTIC MODELS

AGREE ON COLORS, MATERIALS,
TEXTURES.

LOGO PLACEMENT
BRANDING



3D PRINTING

AMAZING RESOLUTION

SHOULD BE LATE IN THE PROCESS



PAINTED
APPEARANCE
MODEL

COMPLETE MODEL

SIZE, SHAPE, COLOR

SOMETIMES WORKING



INVISIBLE PROTOTYPES

ACTING IT OUT

GREAT FOR SERVICES, PROCESSES, AND INTERACTIONS



7-14-28

MAKE A PEANUT BUTTER SANDWICH IN 7
STEPS.

THEN MAKE IT IN 14.

THEN IN 28.

CONTINUE TO DELVE DEEPER TO
UNDERSTAND CONNECTIONS AND GET
NEW INSIGHTS



SCALE!

SCALE

PROTOTYPES DON'T ALWAYS HAVE TO BE
IN SCALE.

WORKING 1:1 DOES HELP
UNDERSTANDING MUCH DEEPER
THOUGH



SCALE

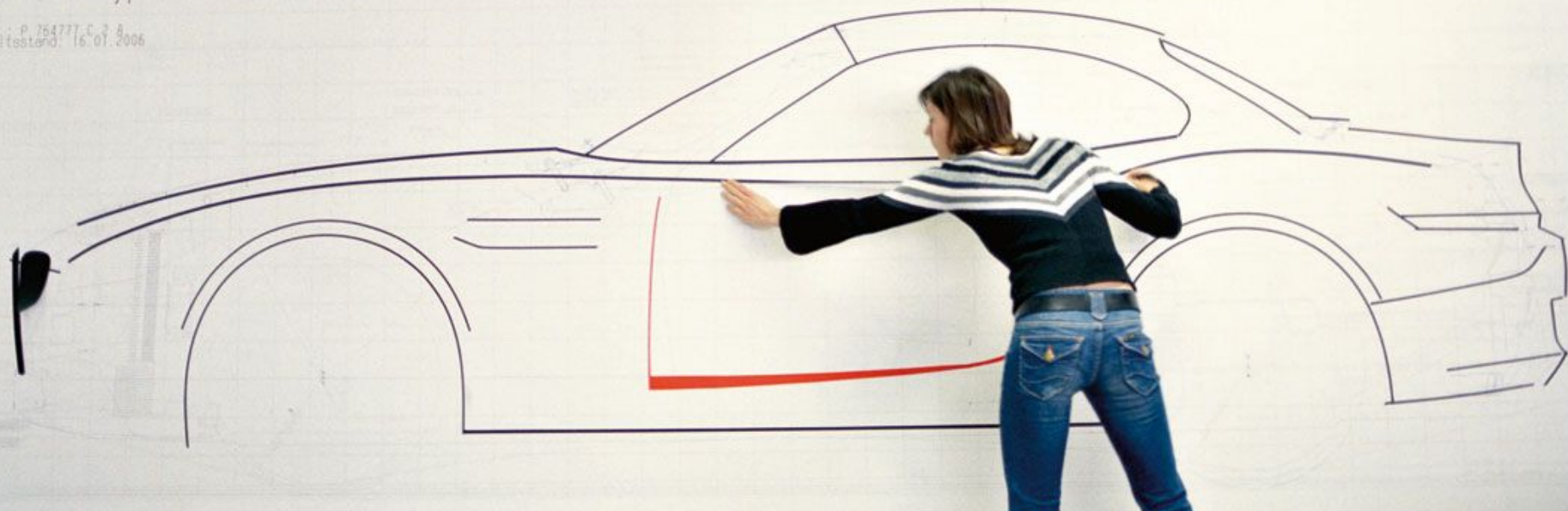
IF YOUR CONCEPT IS A DISPLAY, STAND,
OR AREA, TAPE IT OFF.

LIVE IN IT...
ACT OUT INTERACTIONS...



E89 Gesamtfahrzeugplan (GFP)
Berichtstyp N53B30 LL ECE

Z.Nr.: P 764777, C 2 A
Arbeitsstand: 16.01.2006



HUMAN SCALE

HUMANS WILL USE YOUR PRODUCT SO
START MAKING THEM HOLD IT.

TAPE IT TO THEM!

PUT IT IN A BOX AND HAVE THEM OPEN
IT AND ASSEMBLE




GET IT IN PEOPLE'S HANDS



YOU KNOW WHO KNOWS HOW TO BREAK STUFF?

HAVE HARD
CONVERSATIONS. BE
HONEST.

TALK TO THE VENDOR



YOU KNOW WHO KNOWS HOW TO MAKE
STUFF?

2 ABSOLUTES OF PROTOTYPES

1. There is no set number of prototypes you should make... **But it is definitely more than one.**

2 ABSOLUTES OF PROTOTYPES

1. There is no set number of prototypes you should make... But it is definitely more than one.
2. Each prototype will teach you something...usually it will make your design better.

LEFT TURN!

ELIJAH'S GUIDE TO
MAKING THINGS
REAL

(AND REAL GOOD)



ALIGNMENT
(LINE THINGS UP)



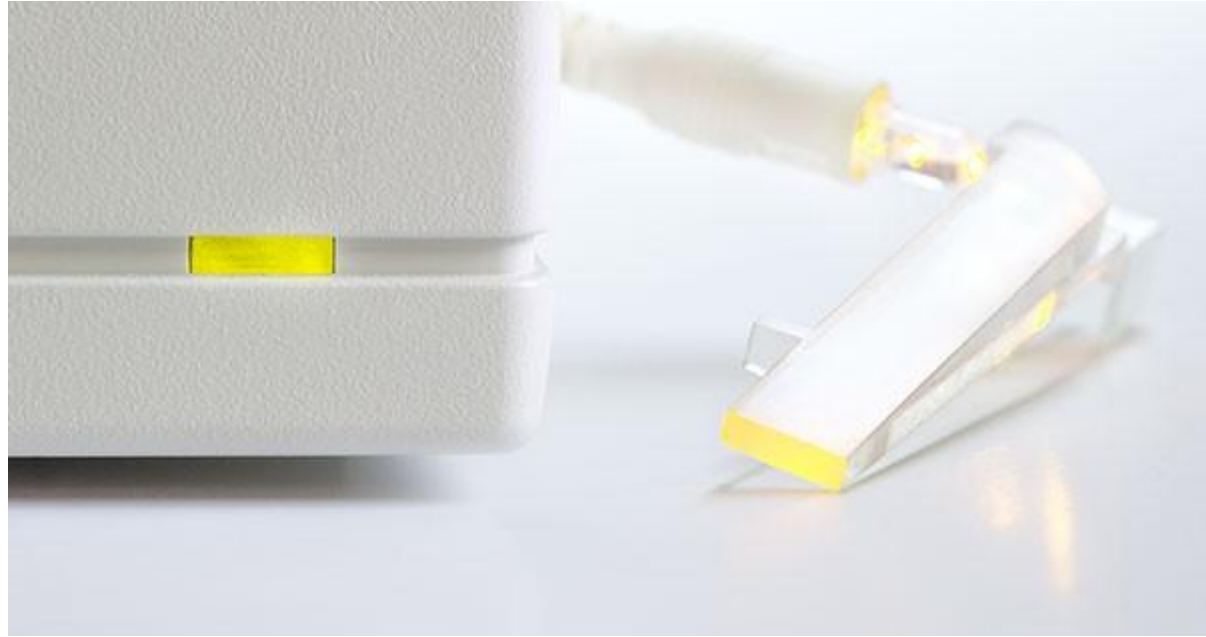
ALIGNMENT
(LINE THINGS UP)



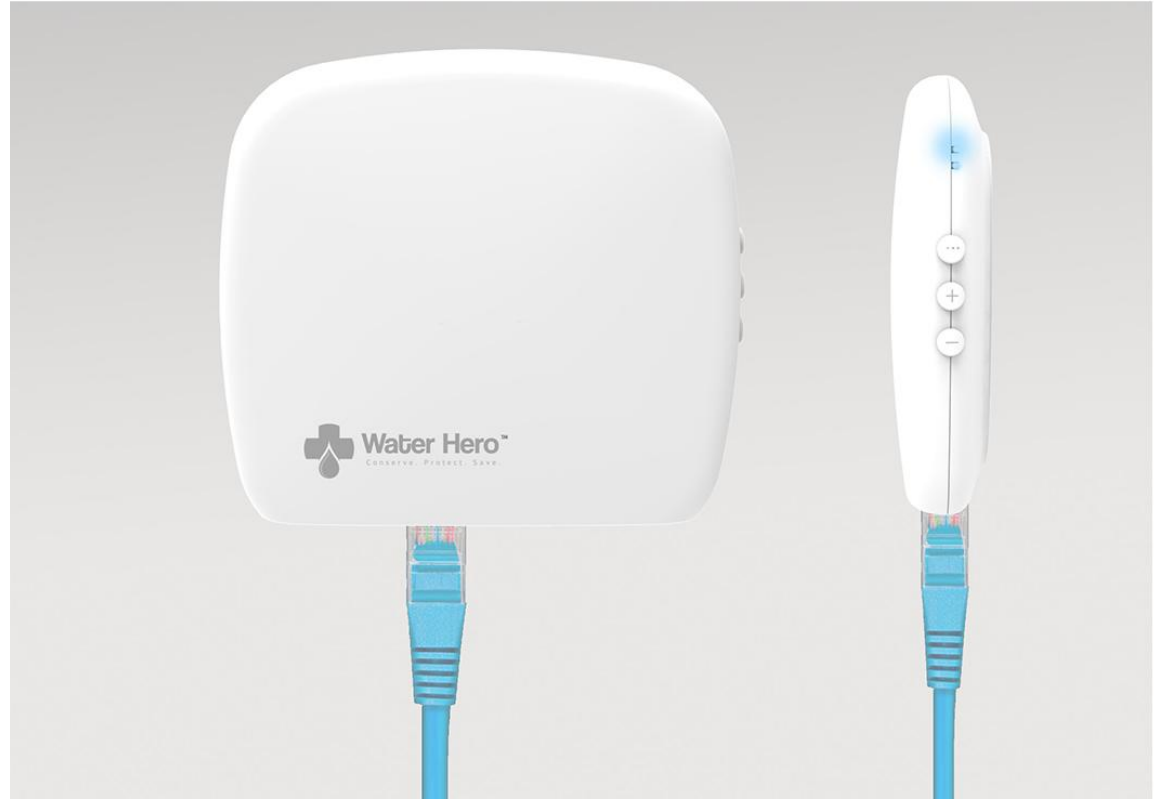
BEAUTY GAP



BEAUTY GAP



BEAUTY GAP



BEAUTY GAP



PICK ONE THING TO
CELEBRATE



COMBINE PIECES



USE MULTIPLE
MATERIALS

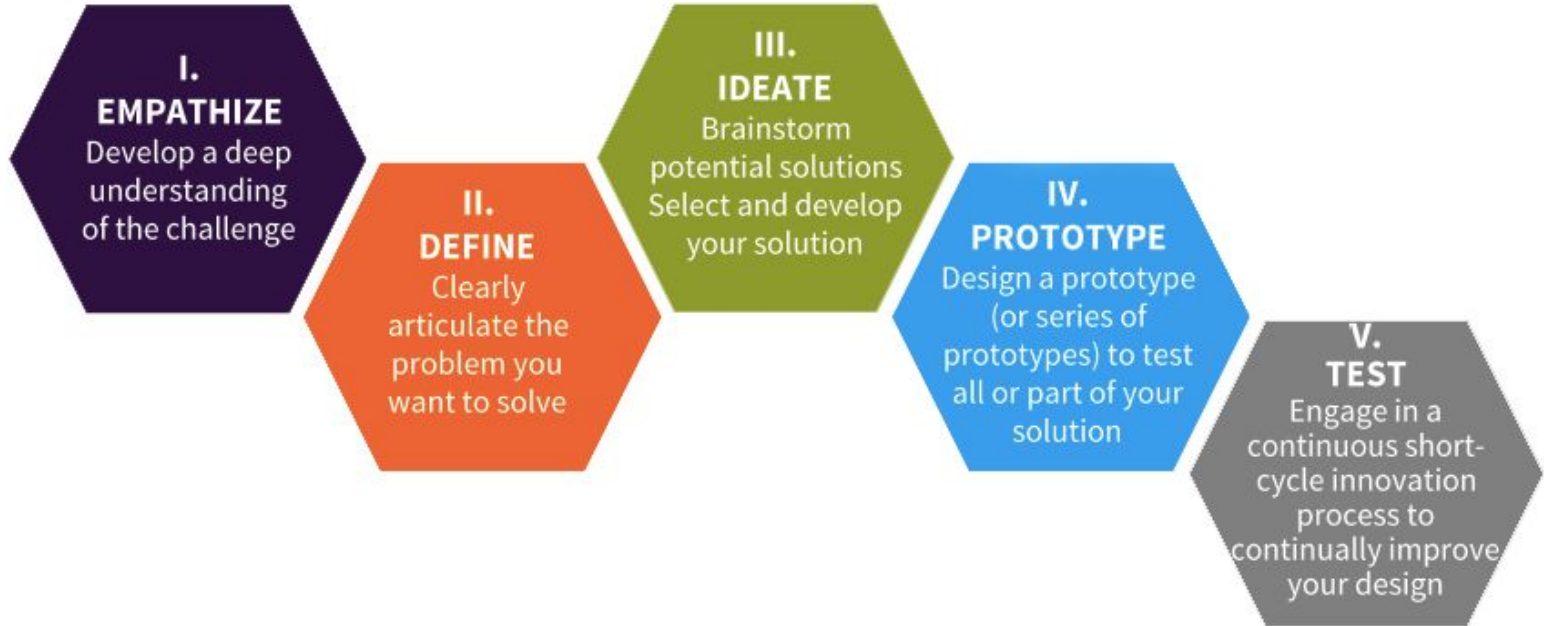


USE SOFTGOODS



PLAY WITH SCALE





THANK YOU!

GO MAKE SOMETHING

GREAT!



Questions?

Elijah@Basedesignco.com