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since 1618

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COST FP1405 Training School – 25 September 2018, Grenoble

MOVING FROM AN IDEA TO PRODUCTION

ANOUK DANTUMA

Design thinking

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PRODUCT DEVELOPMENT PROCESS

General ideation on how to solve a problem

- Market research
- Define target group
- List of requirements
- Feature design

- Concept description
- Relevance/benefits
- Marketing strategy
- Cost breakdown

- Detail design & specs
- Material choices
- Production methods
- Prototyping

- Consumer testing
- Final decisions related to design, marketing, selling prices, etc.

- Brief sales & distribution
- Detailed launch plan
- Review market performance

Idea generation → Concept development → Business cases → Detailed design → Testing & validation → Market introduction

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PRODUCT DEVELOPMENT PROCESS

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| Idea generation | Concept development | Business cases | Detailed design | Testing & validation | Market introduction |

Often referred to as the R&D project

(Fuzzy) front end

Most of how the product will look in the end is decided here!

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STAGE 2:
CONCEPT DEVELOPMENT

CONCEPT DEVELOPMENT
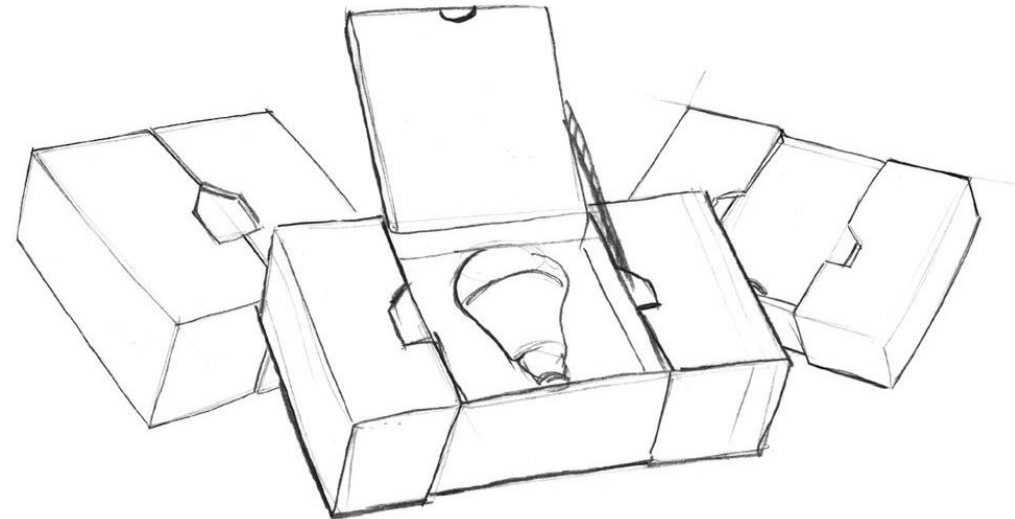
Composing a more concrete image based on an idea,
by putting the idea in context of use situations and competitors
and elaborating on how the different functions can be fulfilled.

CONCEPT DEVELOPMENT: MARKET RESEARCH

CONCEPT DEVELOPMENT: MARKET RESEARCH

- ## How does your idea stand out?
  - Improved functionality
  - Easier to use
  - Better looking
  - Cheaper
  - Different use situations
  - Different target group
  - etc.

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| Idea generation | Concept development | Business cases | Detailed design | Testing & validation | Market introduction |

CONCEPT DEVELOPMENT: DEFINE TARGET GROUP

To whom

Who are

- Consumer
  - Who
  - What
  - What
  - What
- Companie
  - What
  - What
  - How quality
  - Which

How can

CONCEPT DEVELOPMENT: TARGET GROUP

The Greenhorn	The Casual User	The Texter	The Business User	The Power User	The Hacker
JOHN	**EMILY**	**AKIKO**	**STEPHAN**	**ROBERTO**	**RICKY**

JOHN — The Greenhorn

Profile
- Probably the single biggest segment of mobile users.
- Want simple: turn on their mobile, dial a number and talk to their intended party.
- Don't care about anything other than the mobile being able to be used as a phone, and possibly contacts.

Scenario
I didn't get my first phone until 2001. My daughter bought it for me. I didn't feel it was necessary but since then, I have it with my all the time and use it more than my home phone.

EMILY — The Casual User

Profile
- Take advantage of most phones features, but not all.
- Use the phone to make calls, use the contacts, send text messages, and take pictures.
- Their mobile is always with them.

Scenario
My phone has to look cool. I personalize it with decals, charms, and ring tones. I talk on it everywhere, so my phone style is everything. Of course, it has to work too. I usually talk on the phone, but recently started taking pictures and recording video. My phone is my favorite accessory.

AKIKO — The Texter

Profile
- Texting is far more popular than calling.
- Will send and receive thousands of text messages per month.
- Rarely use their phones for calling.
- Want a clean texting interface with the fastest possible input.

Scenario
I prefer texting than calling because it's more fun and creative. My friends and I probably text each other around 40 times a day. We'll even text to order food. It's far more interesting and less intrusive. I don't have to worry about disturbing people on the train with my talking. I love it.

STEPHAN — The Business User

Profile
- Wants a phone that is simple, but functions as an integrated smart device.
- Want to read email and call back the sender with the least amount of effort.
- Needs "Popular" mail server integration, including Blackberry and Exchange.

Scenario
My mobi is my life. Without it my business would suffer. I take conference calls while driving down the M25. If someone text me, I need to ring them without taking my eyes off the road. And since I use my mobi everywhere, it needs to be durable. The last thing I need is for it to break after one drop.

ROBERTO — The Power User

Profile
- Will use almost all of the built-in functionality.
- Will also extend their phones functionality with additional software.
- Will flip through every menu options and changing settings.

Scenario
I'm addicted to new toys. I get the latest gadgets as soon as they arrive on the market. I upgrade my phone every 6 months. I guess you can say this is almost a sport for me. Or an addiction? I just love to explore the latest and how it can make life fun.

RICKY — The Hacker

Profile
- Care more about customization.
- Want to make changes to every aspect of the phone.
- Belong to mailing lists and forums about hacking the phone.
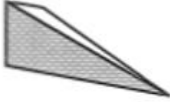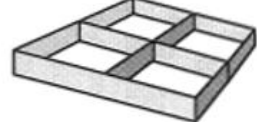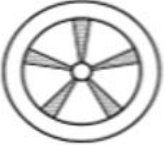- Contribute to the open source community.
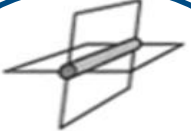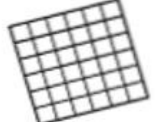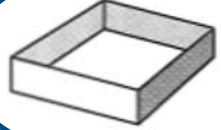
Scenario
As soon as I found out about an open source phone, I jumped on it. I created two apps for the phone and am working on the texting solution. I probably should spend more time at my day job, but this is far more fun. Of course, I use my phone for calls and texting too.

CONCEPT DEVELOPMENT: LIST OF REQUIREMENTS

- What is needed to be functional for the targeted application?

- What is needed to appeal to/be usable by target group?

- What is needed in terms of ergonomics/safety?

- What is needed to be producible? Which processes are available?

- What is needed to meet with legislation?

- What is acceptible in terms of costs?

- What is needed to be sustainable?
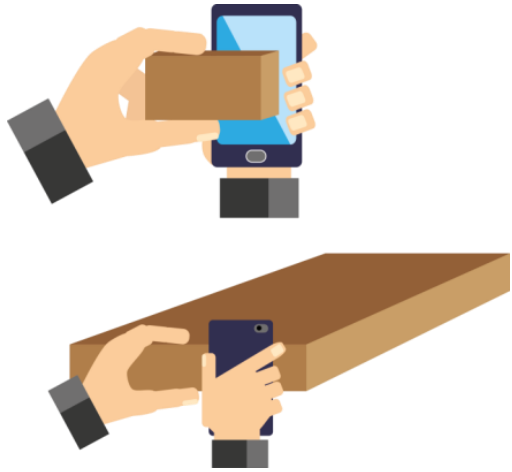
CONCEPT DEVELOPMENT: FEATURE DESIGN

1. Define the features you want to develop ideas for. Place them in the first column.

2. Think of different solutions for each feature. Place them in the corresponding rows.

3. Pick one from each row to compose your concepts.

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Idea generation | Concept development | Business cases | Detailed design | Testing & validation | Market introduction

CONCEPT DEVELOPMENT: FEATURE DESIGN
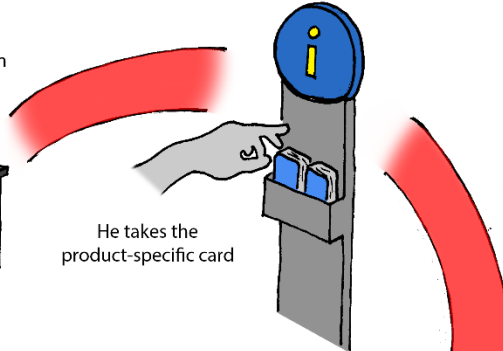
Imagine potential uses
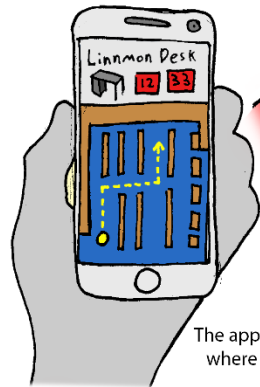
→ **Scenarios**

IKEA
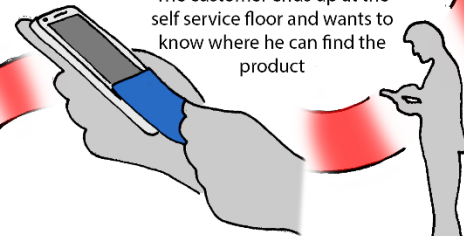
A customer sees an IKEA product that interests him

He takes the product-specific card

ZELFBEDIENINGSMAGAZIJN

The customer ends up at the self service floor and wants to know where he can find the product

Linnmon Desk

He uses the card with the PaperCode on his smartphone

The app shows the customer where the product can be found

The customer follows the instructions and finds the product

IKEA
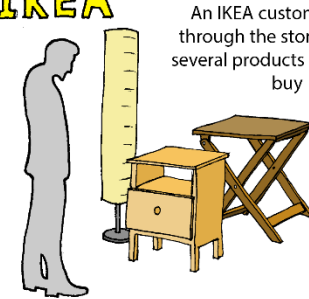
An IKEA customer walks through the store and sees several products he wants to buy
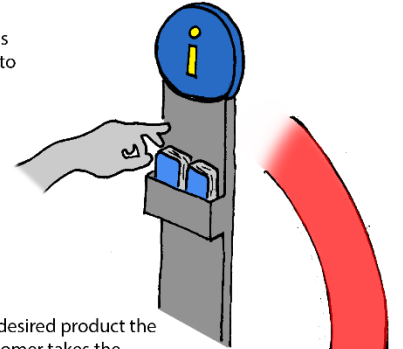
At each desired product the customer takes the corresponding product card

IKEA TARVA
IKEA ÄPPLARÖ
IKEA HOLMÖ
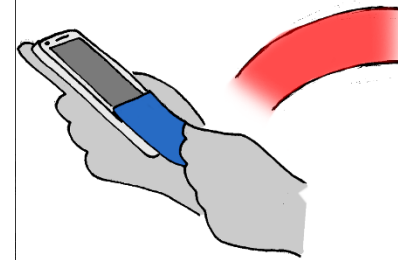
Each product card is used by holding the card agains the touchsscreen of his smartphone
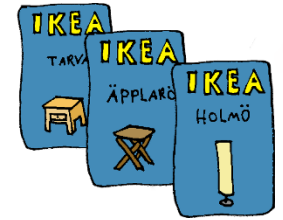
The shopping list shows all the desired products with price, location and the total amount of money the customer will spend

When the customer arrives at the stockroom his shopping list will be complete

€6,99
€19,95
€39,95
Tot: €66,89

STAGE 3:
BUSINESS CASES

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BUSINESS CASES

A Business Case is a report or summary meant to convince the reader of why an idea or concept is sensible and is worth investing (money or time) in.

It can be considered as a proposal for continuing the R&D project, but also functions as a guideline for the further development (as it shows the weaknesses as well).

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BUSINESS CASES: STEEP

SOCIAL
Consumer behavior, lifestyles, values, needs/desires, acceptance, perceived safety, etc.

TECHNOLOGICAL
Materials, production processes, dimensions, functionality in different use situations (incl unintended), reliability, end-of-life options, etc.

ECONOMICAL
Availability & reliability of suppliers, IP-rights, expenses & revenues, selling price vs added value/benefits, marketing strategies, etc.

ECOLOGICAL
Sustainability; emissions, end-of-life, LCA's, circularity, biobased content, etc.

POLITICAL
Related governmental topics such as legislation, sustainability goals, etc.

BUSINESS CANVAS MODEL

Source: businessmodelgeneration.com
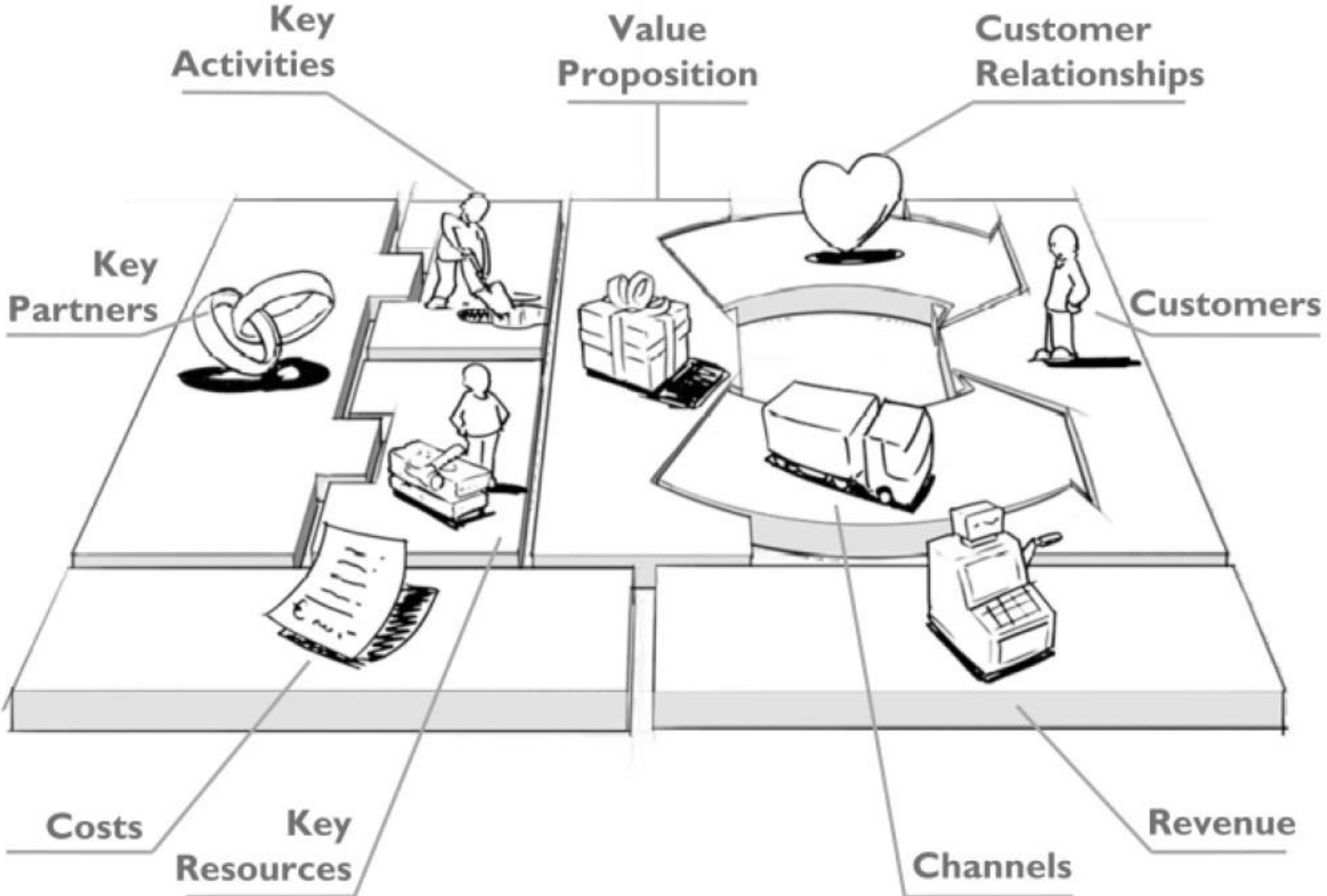
BUSINESS CANVAS MODEL: CUSTOMER SEGMENTS

For whom are we creating value?
Who are our most important customers?

Mass market / Niche market, Segmented / Diversified, Multi-sided platforms

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BUSINESS CANVAS MODEL: VALUE PROPOSITIONS
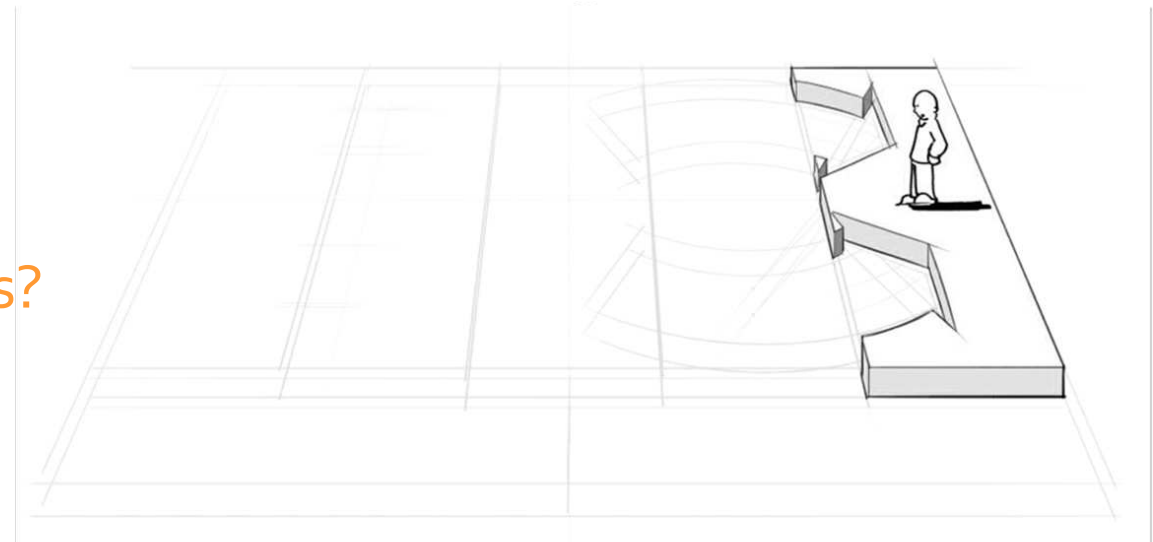
What value do we deliver?
Which problems are we helping to solve?
What bundles of products and services are we offering?
Which needs are we satisfying?
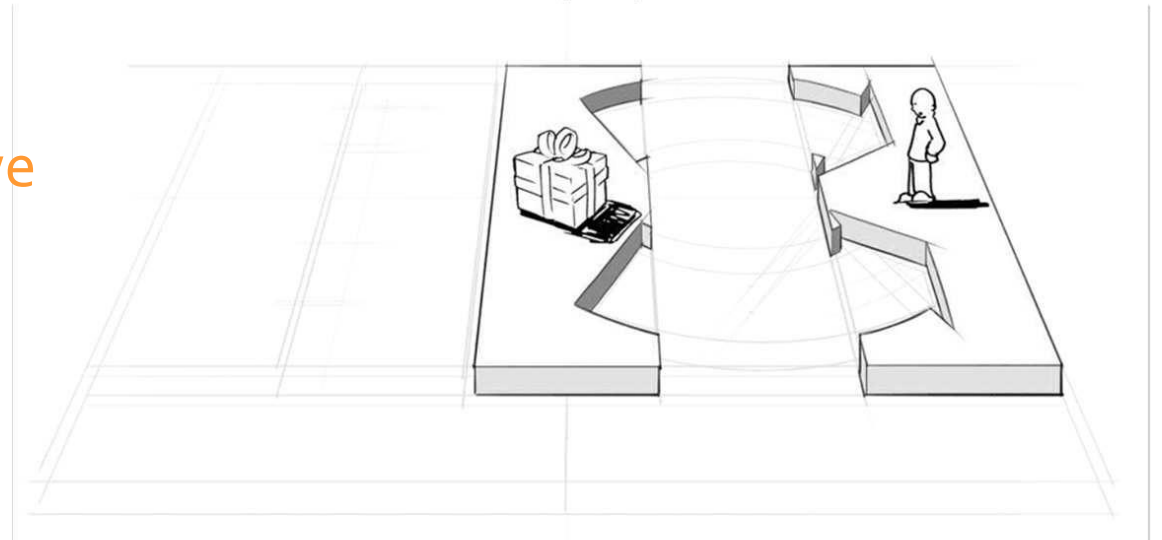
Newness, performance, customisation, getting the job done, design, brand, status, price, cost reduction, risk reduction, accessibility, convenience, usability

BUSINESS CANVAS MODEL: CHANNELS

Through which channels do our customers want to be reached?

How are we reaching them now?

How are our channels integrated?

Which ones work best / are most cost-efficient?

How are we integrating them with our customer routines?
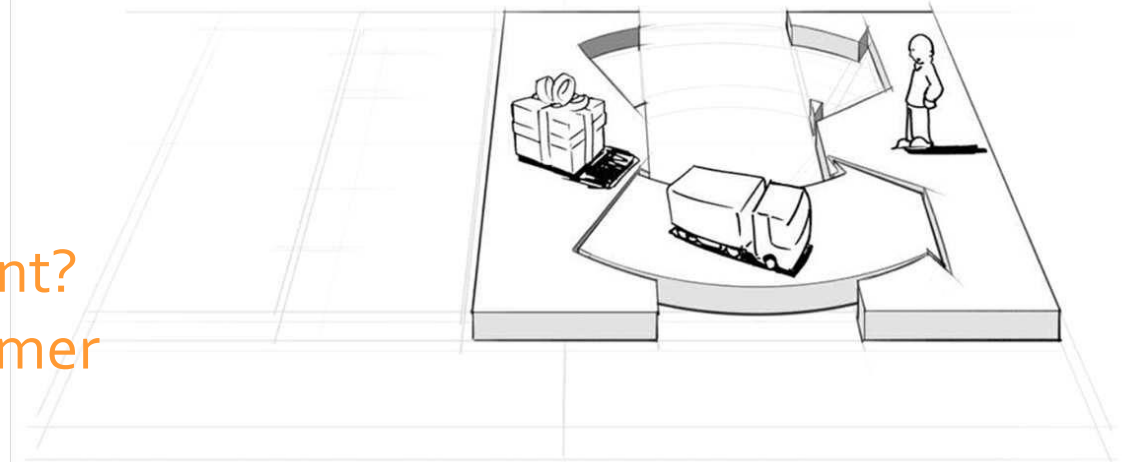
Awareness, evaluation, purchase, delivery, after sales

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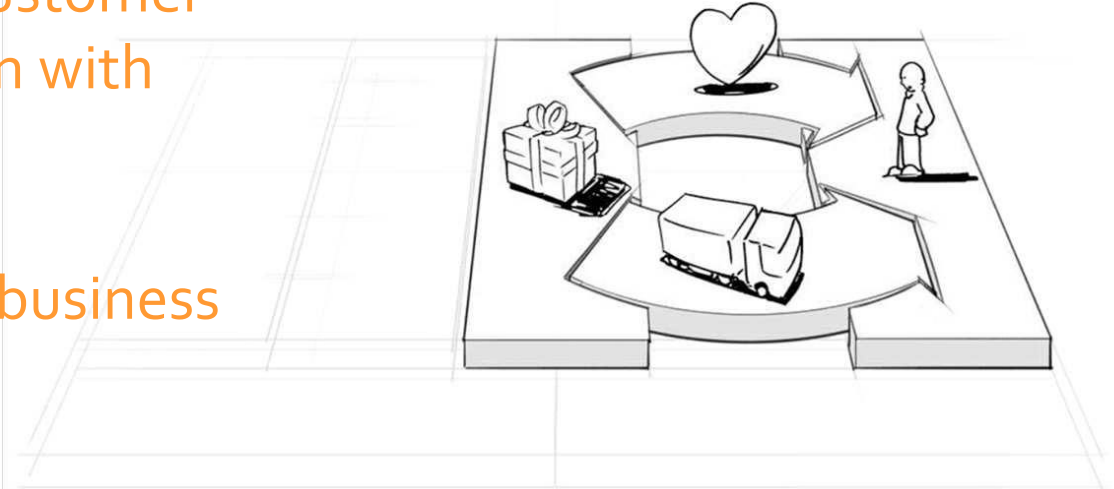# BUSINESS CANVAS MODEL: CUSTOMER RELATIONSHIPS

What type of relationship does each of our customer segments expect us to establish and maintain with them?
Which ones have we established?
How are they integrated with the rest of our business model?
How costly are they?

Personal assistence, Dedicated personal assistance, Self-service, Automated services, Communities, Co-creation

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BUSINESS CANVAS MODEL: REVENUE STREAMS

For what value are our customers really willing to pay?

For what do they currently pay?

How are they currently paying?

How would they prefer to pay?

How much does each revenue stream contribute to overall revenues?
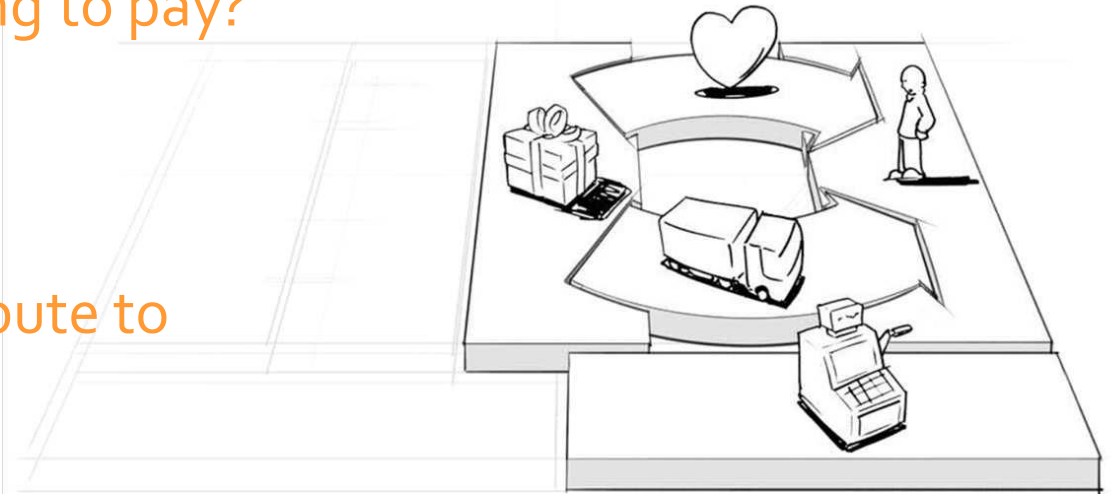
Fixed/dynamic pricing, Asset sale, Usage fee, Lending/renting/leasing, Licensing, Advertising

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BUSINESS CANVAS MODEL:
KEY RESOURCES

What key resources do our value propositions / distribution channels / customer relationships / revenue streams require?
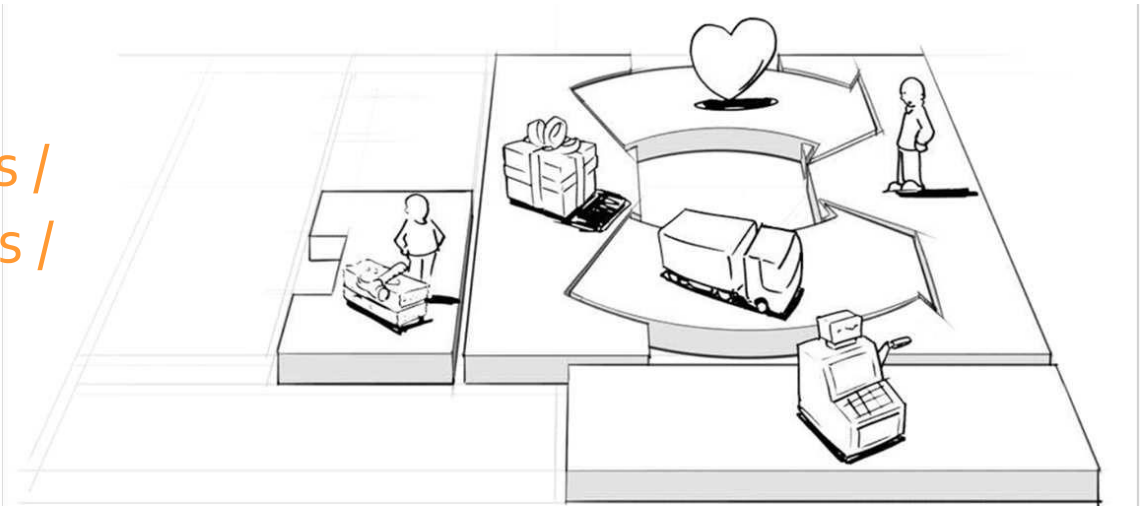
Physical, Intellectual, Human, Financial

BUSINESS CANVAS MODEL:
KEY ACTIVITIES

What key activities do our value propositions / distribution channels / customer relationships / revenue streams require?
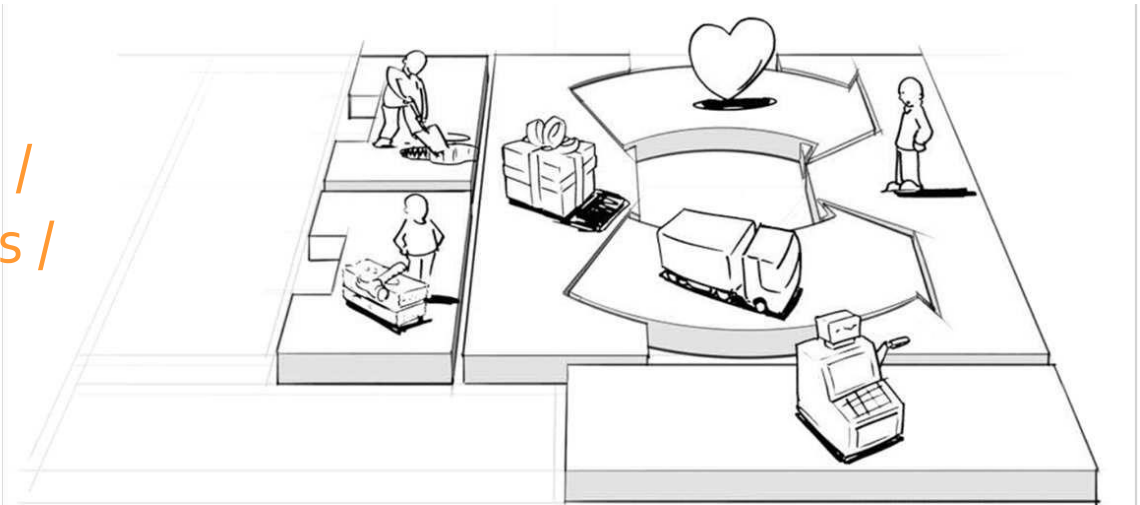
Production, Problem solving, Platform/network

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BUSINESS CANVAS MODEL:
KEY PARTNERS

Who are our key partners?
Who are our key suppliers?
Which key resources are we acquiring from partners?
Which key activities do partners perform?
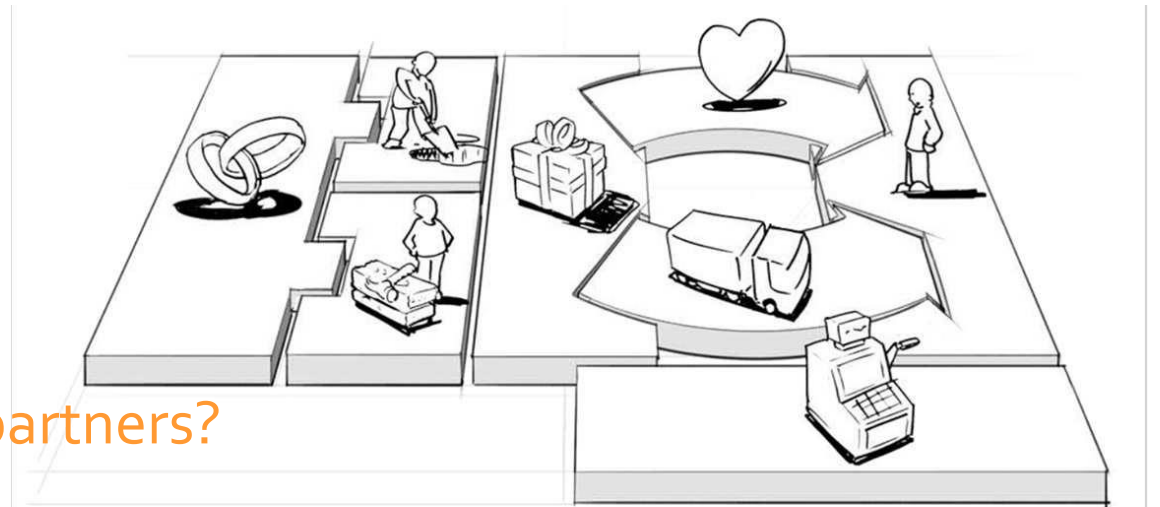
Optimisation and economy, Reduction of risk and uncertainty, Acquisition of particular resources and activities

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BUSINESS CANVAS MODEL: COST STRUCTURE

What are the most important costs inherent in our business model?
Which key resources are most expensive?
Which key activities are most expensive?
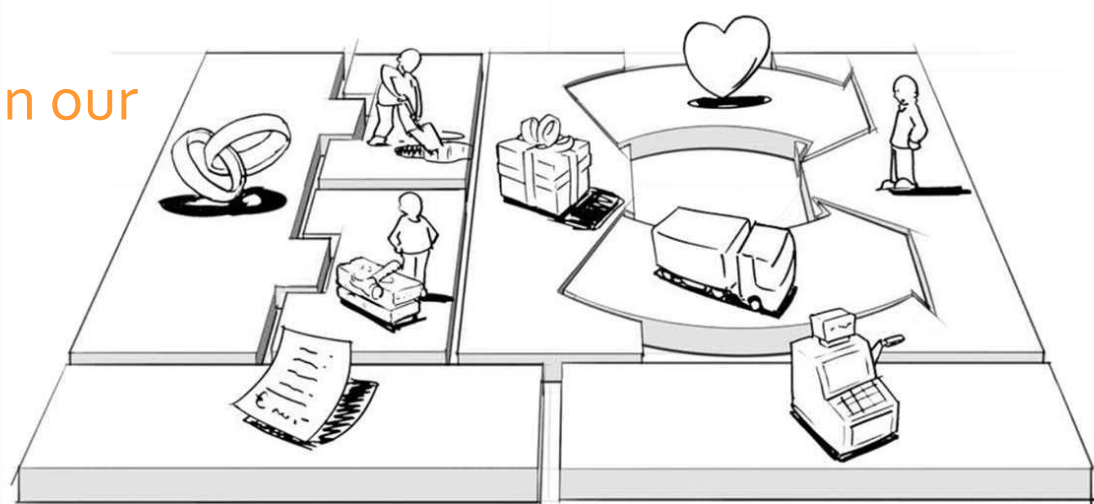
Cost driven / value driven business, Fixed / variable costs, economies of scale / scope

STAGE 4:
DETAILED DESIGN

DETAILED DESIGN
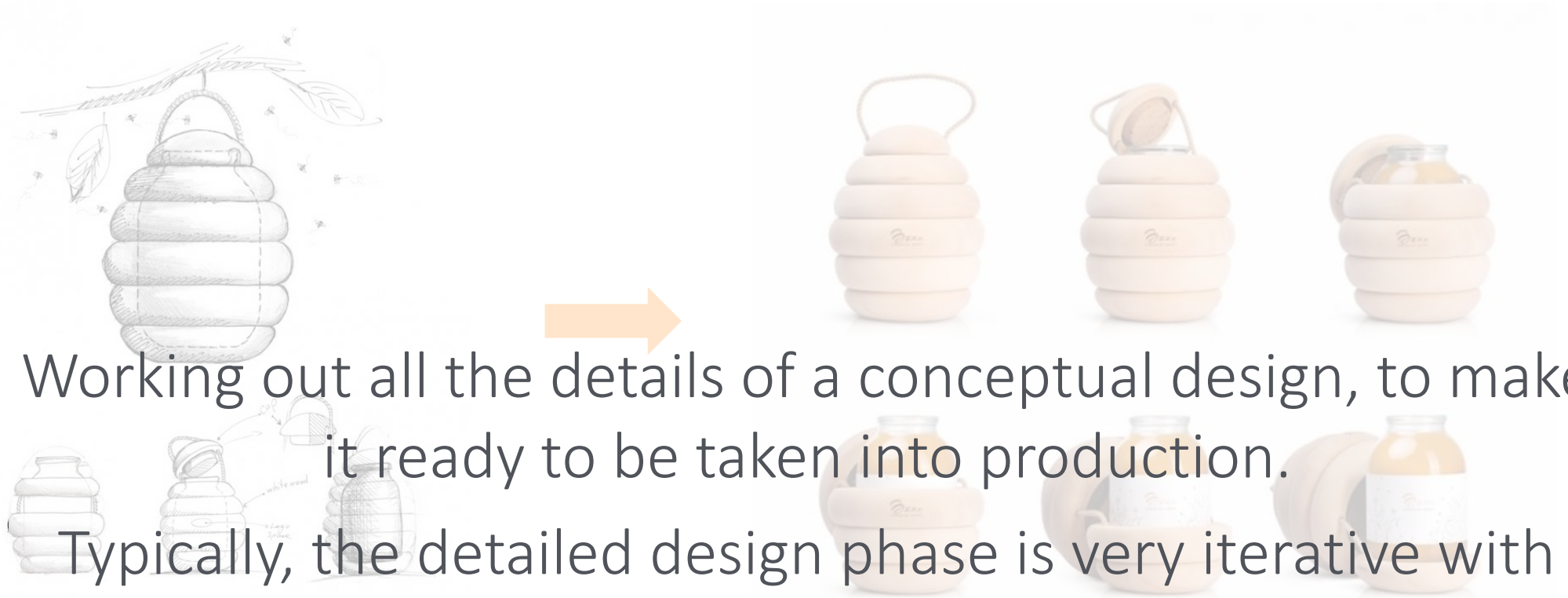
Working out all the details of a conceptual design, to make it ready to be taken into production.

Typically, the detailed design phase is very iterative with the testing & validation phase as it continues until the design meets all requirements.

DETAILED DESIGN

Detailed design →

Conceptual Design

Materials

Production methods
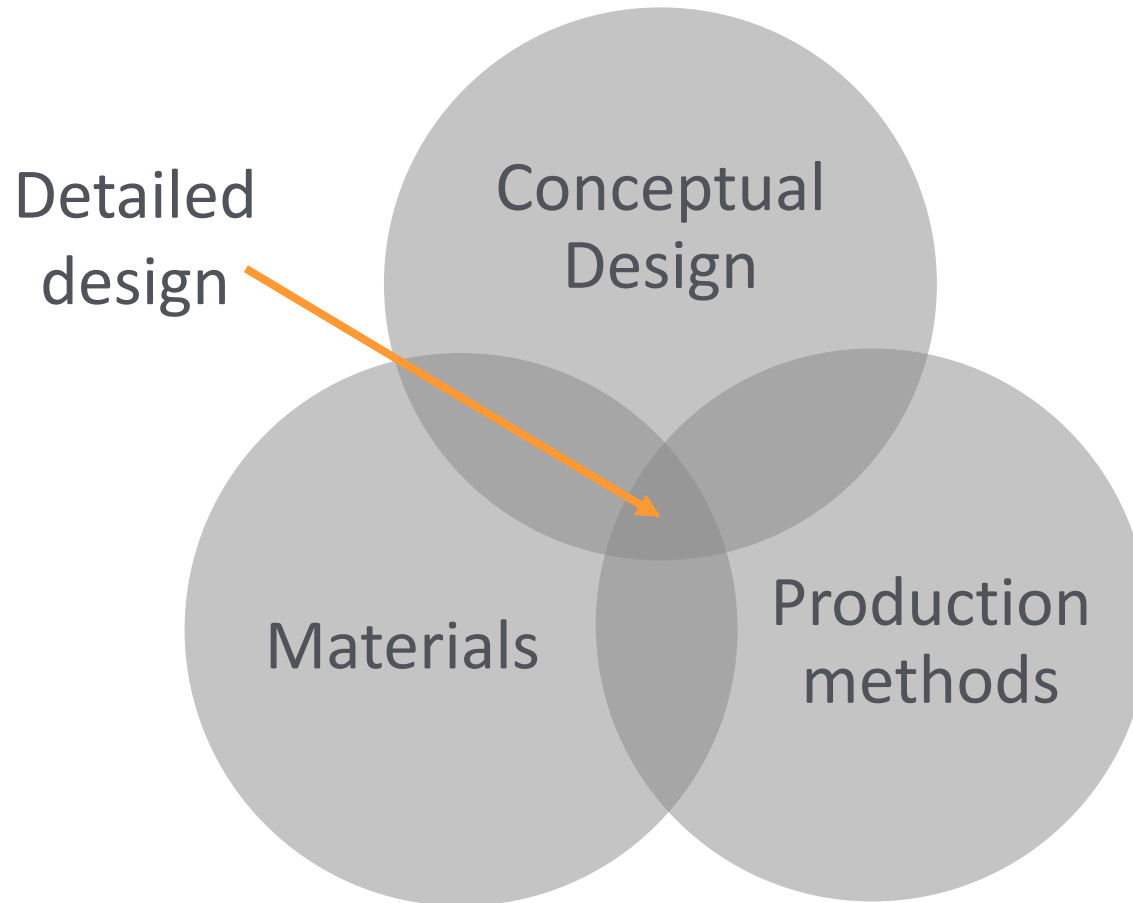
Characteristics:
- Highly iterative
- Often involves many disciplines
- Lots of testing

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| Idea generation | Concept development | Business cases | Detailed design | Testing & validation | Market introduction |

MATERIALS

Different materials = different properties, possible shapes, production methods & costs

MATERIAL CHOICES

General properties of different materials:

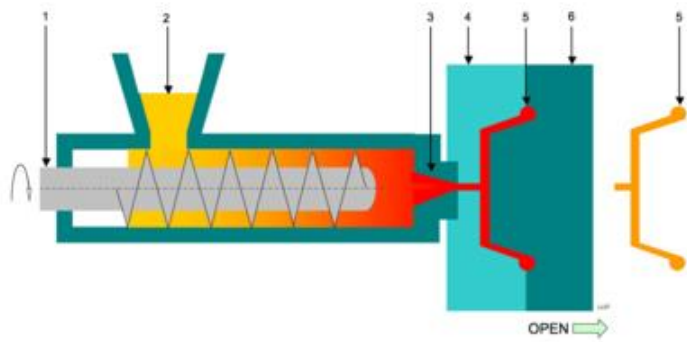|	Gas & moisture barrier	UV-barrier	Temperature resistance	Static load	Cushioning
Glass	Yes	Green/brown glass only	High, sterilizing	No problems	No
Metals (steel & aluminum)	Plate & foil: yes Metallized: limited	Excellent	High, sterilizing	Used to get rid of static load	For heavy products
Plastics	Depends on type	Depends on colour & thickness	Depens on type	Forces static load	Expanded plastics
Paper & board	Permeable	Depends on colour & thickness	High, not under humid conditions	Forces static load in some cases	Corrugated, honeycomb, molded fibre

PRODUCTION METHODS: PLASTICS

Extrusion molding/casting (3D/2D)

Extrusion blow molding

1. Parison ready
2. Mold closes over parison
3. Parison inflated to fill mold. Extruder forming new parison.
4. bottle removed and trimmed.

Thermoforming

Positive mold

Heated plastic sheet

Negative mold
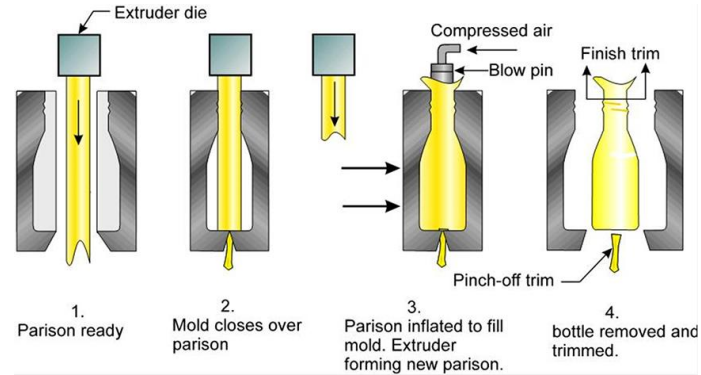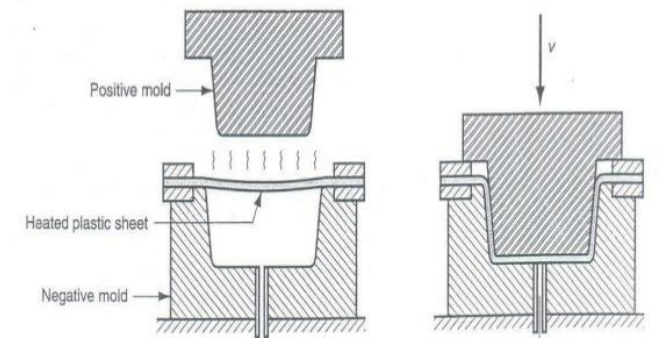
Blown film extrusion

BLOWN FILM LINE
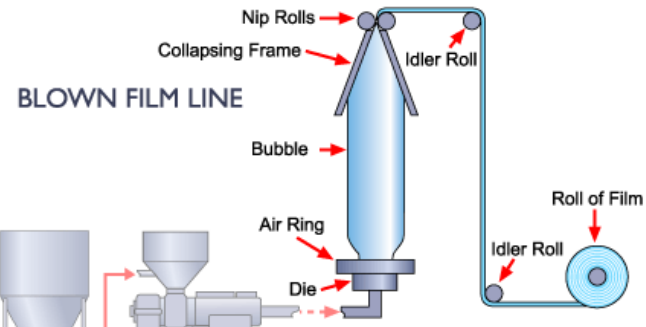
Lamination

Printing

Sealing

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PRODUCTION METHODS: PAPER & BOARD

Water

Fibers

Conversion

Steam

Electricity

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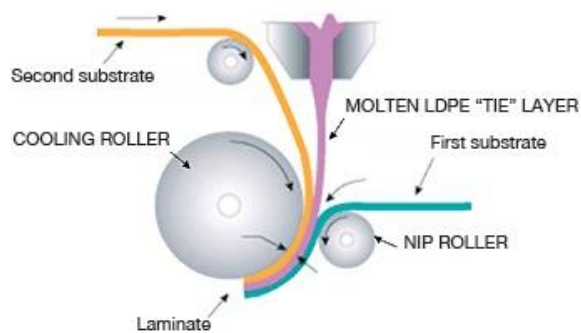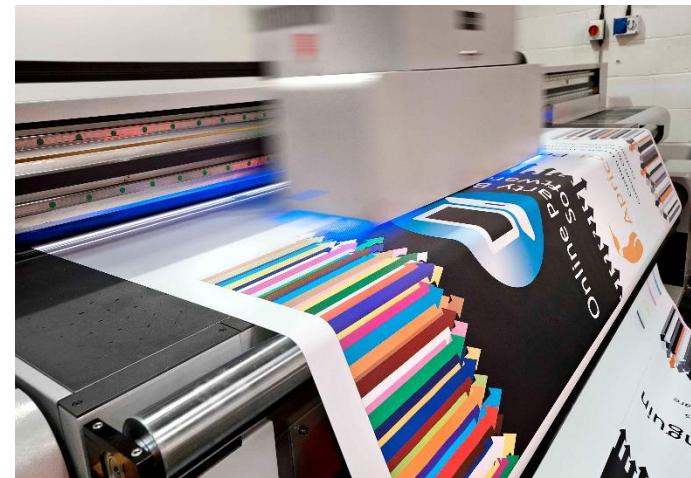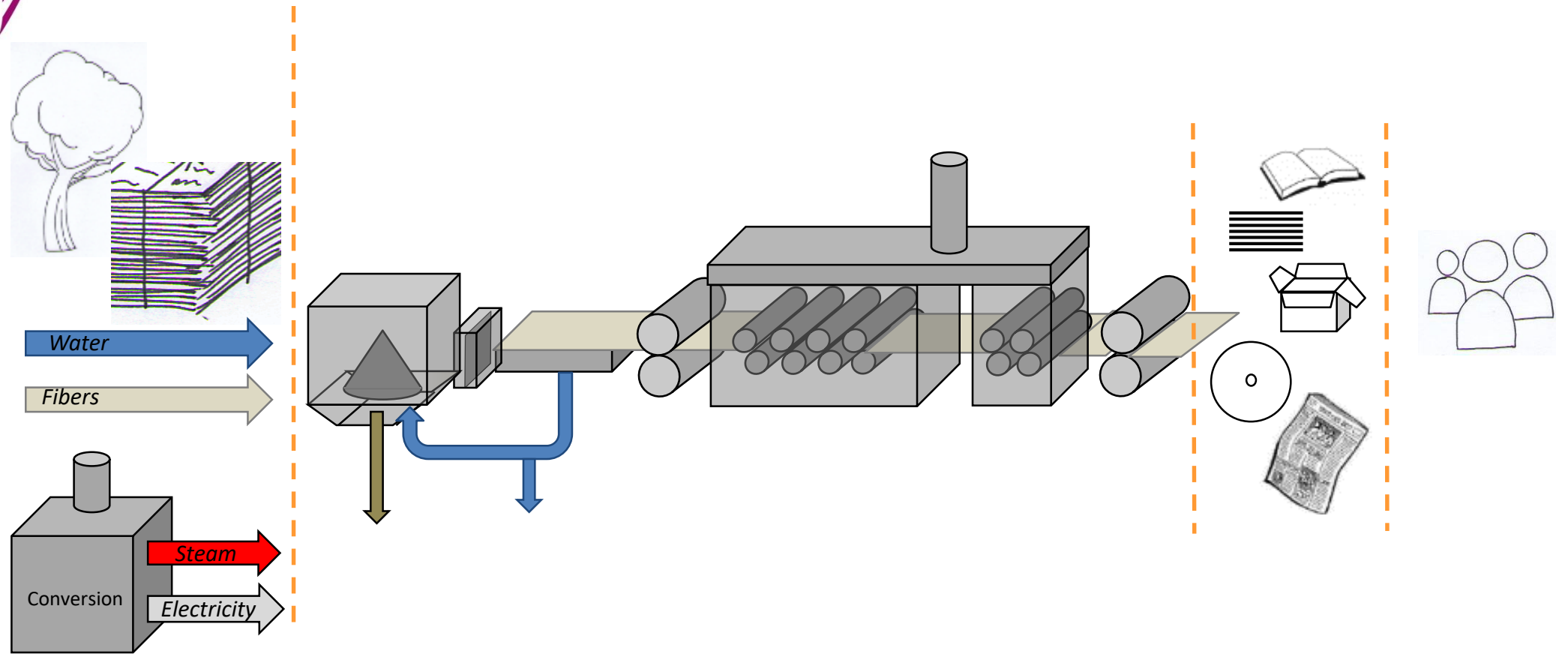
PRODUCTION METHODS: PAPER & BOARD

Lamination
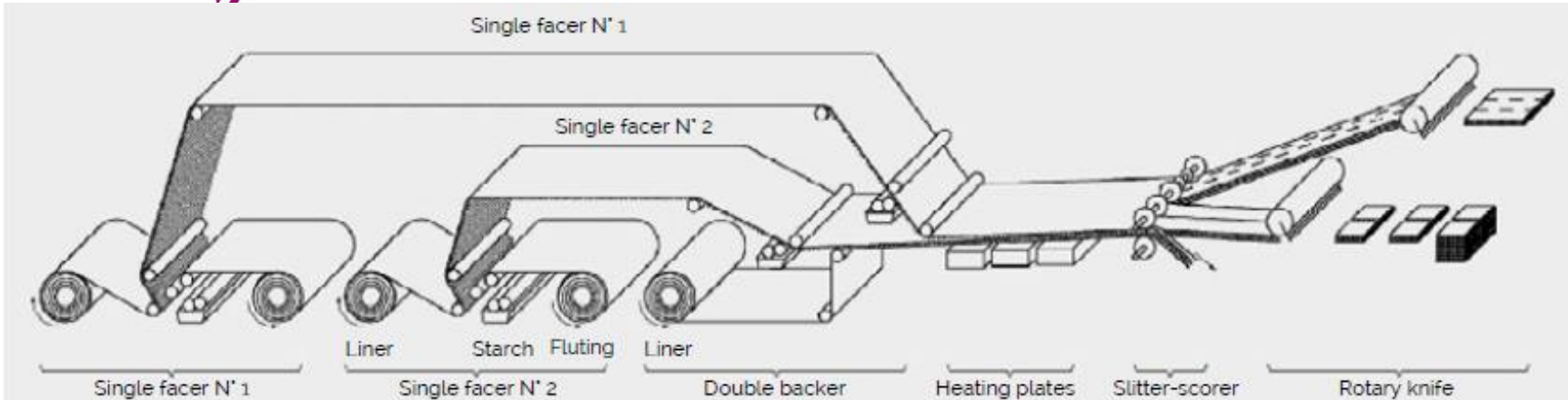
Printing

Creasing
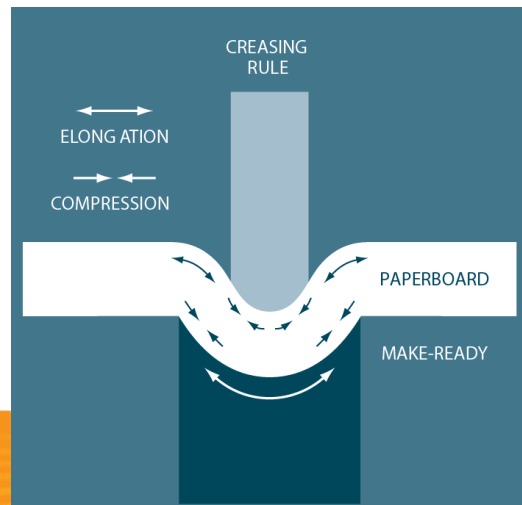
Die-cutting
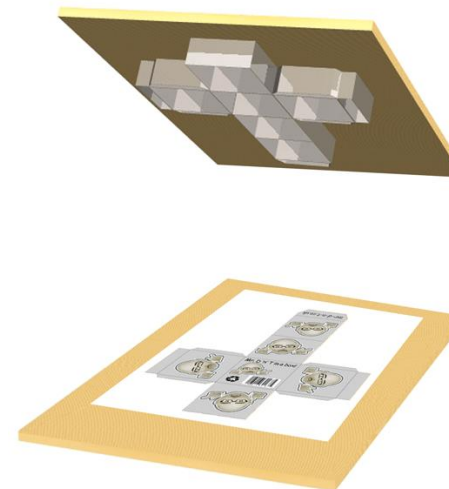
Glueing

PRODUCTION METHODS

Where in the process to add your active/intelligent components?

Surface treatment: paper production

Surface treatment: During conversion

In paper pulp

Water

Fibers

Conversion

Steam

Electricity

→ *Every option has different possibilities & effects*
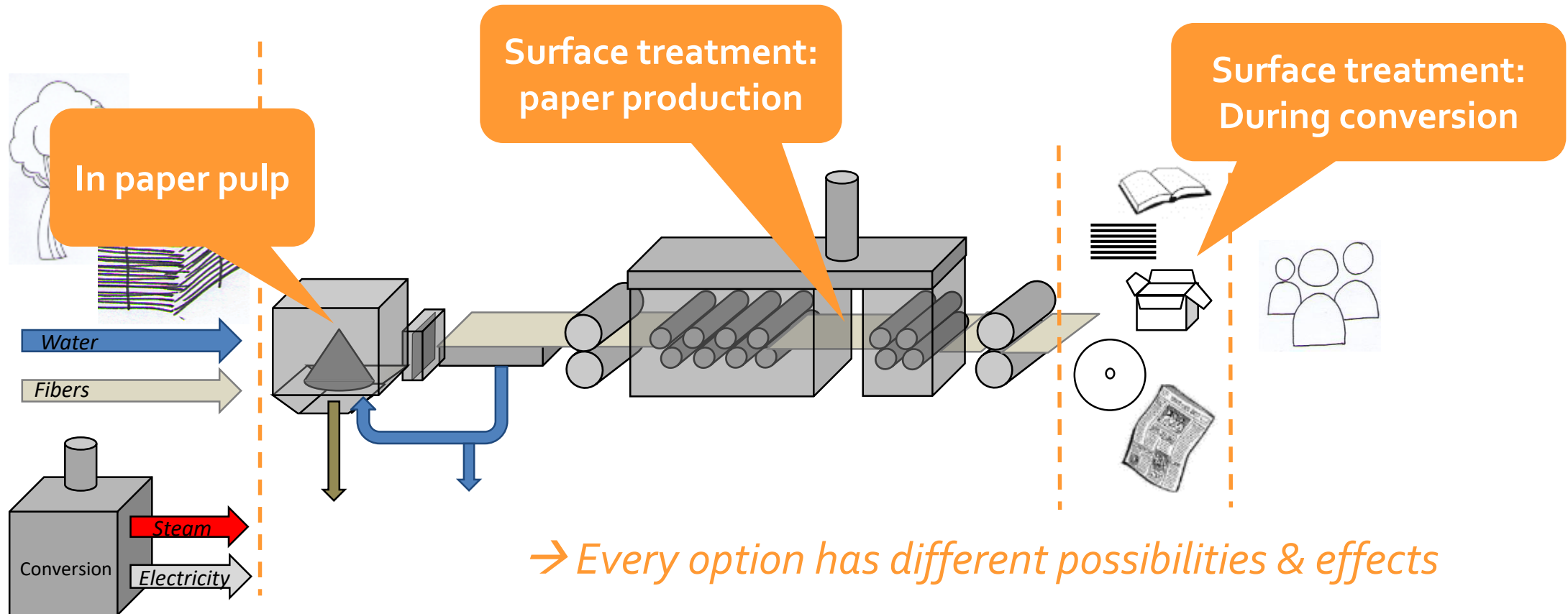
PRODUCTION METHODS

Design for Manufacturing (DFM) = thinking of producibility already early in the design process. It is important, because it can help to:

– ensure that the design can be produced using existing equipment

– lower the amount of design iterations required to make the product suitable for production

– speed up time to production

– simplify the design, thereby increasing quality

– lower development and production costs (= increased profitability)

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PRODUCTION METHODS: EXAMPLES

Project:

Active packaging papers to eliminate *Botrytis Cinerea* mold in flowers during transport

Active components added to the paper in the paper mill itself (not in conversion)

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PRODUCTION METHODS: EXAMPLES

max. 30°C!

Paper mill drying section

Up to 120°C

Essential oils

Encapsulation of EO's

Essential oils

Carrier

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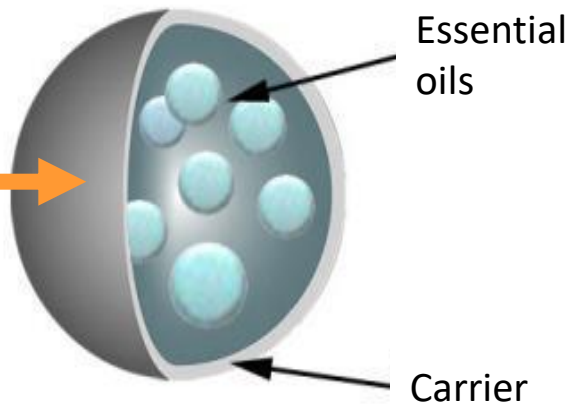
PRODUCTION METHODS: EXAMPLES

Sulphite-based active component

The Ph Scale

Acidic   Alkaline

Neutral

Unknown substances in process water → acidic conditions = DANGER!

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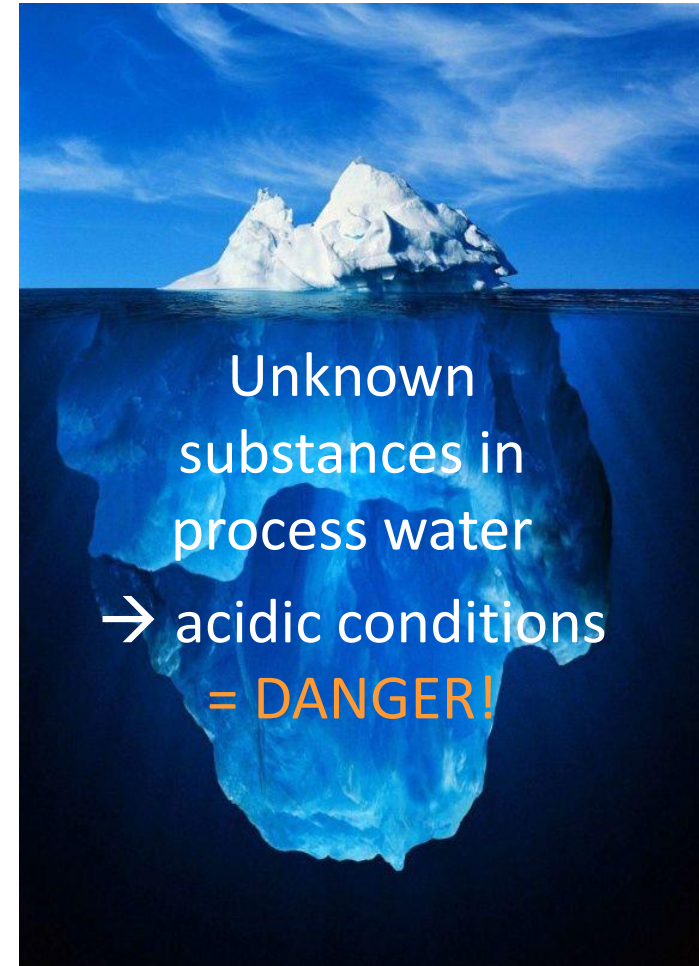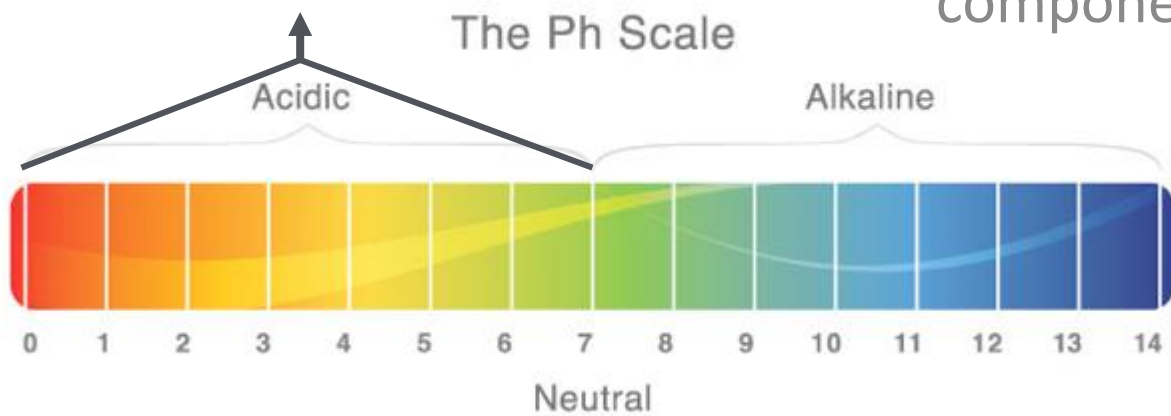
PRODUCTION METHODS: EXAMPLES
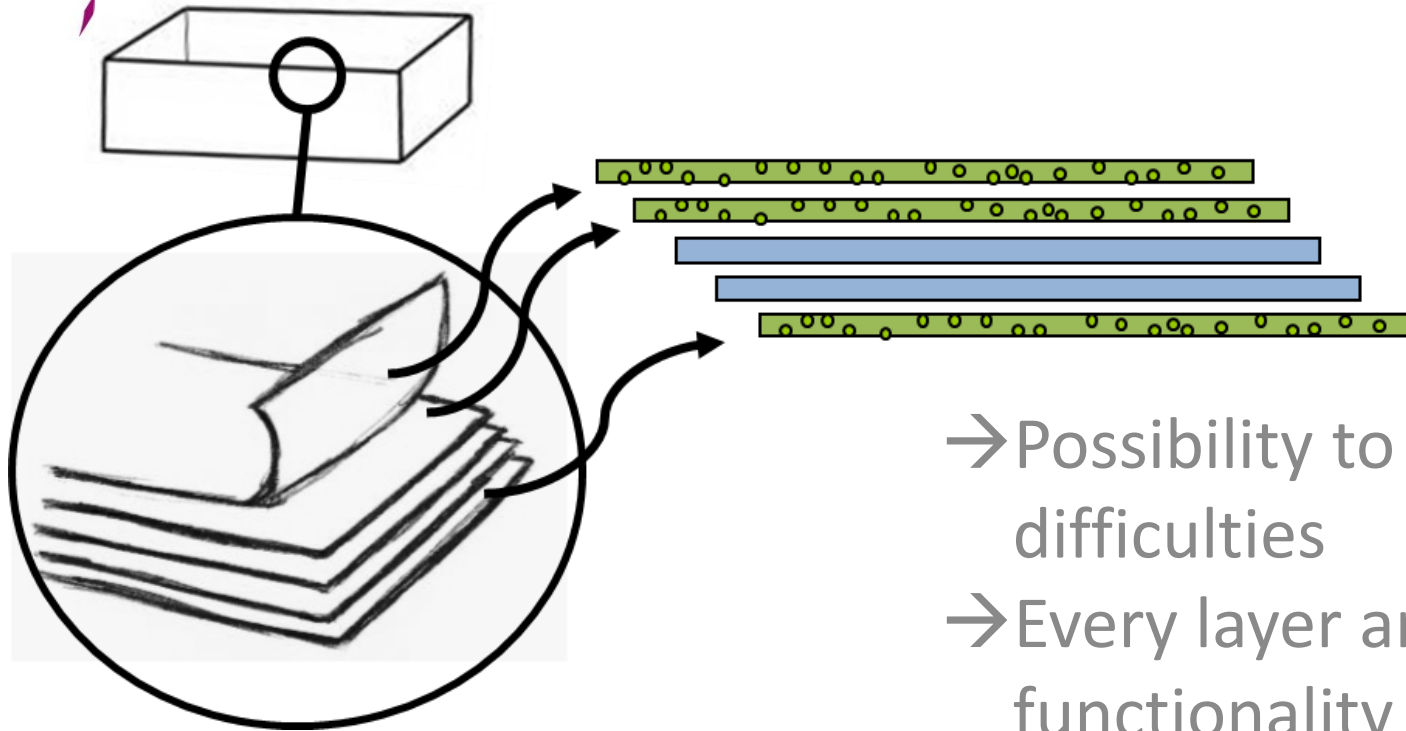
Lamination = several layers

→Possibility to bypass production-related difficulties

→Every layer another active/intelligent functionality

→Apply active/intelligent functionality only in one layer = cost-friendly

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HOW LONG WILL IT LAST?

US ANNUAL CONSUMPTION per capita 2006 (grams)

100,000
10,000
1000
100
10
1
0.10
0.01

20.3kg 1.7kg 8.1kg 0.07g 0.13g 0.6 g n/a 0.42g 5.3kg 753g 101kg 0.58g 0.06g 4.5kg 20g 193g 76g 2g

ALUMINIUM ANTIMONY CHROMIUM COPPER GALLIUM GERMANIUM GOLD HAFNIUM INDIUM LEAD NICKEL PHOSPHORUS PLATINUM RHODIUM SILVER TANTALUM TIN URANIUM ZINC
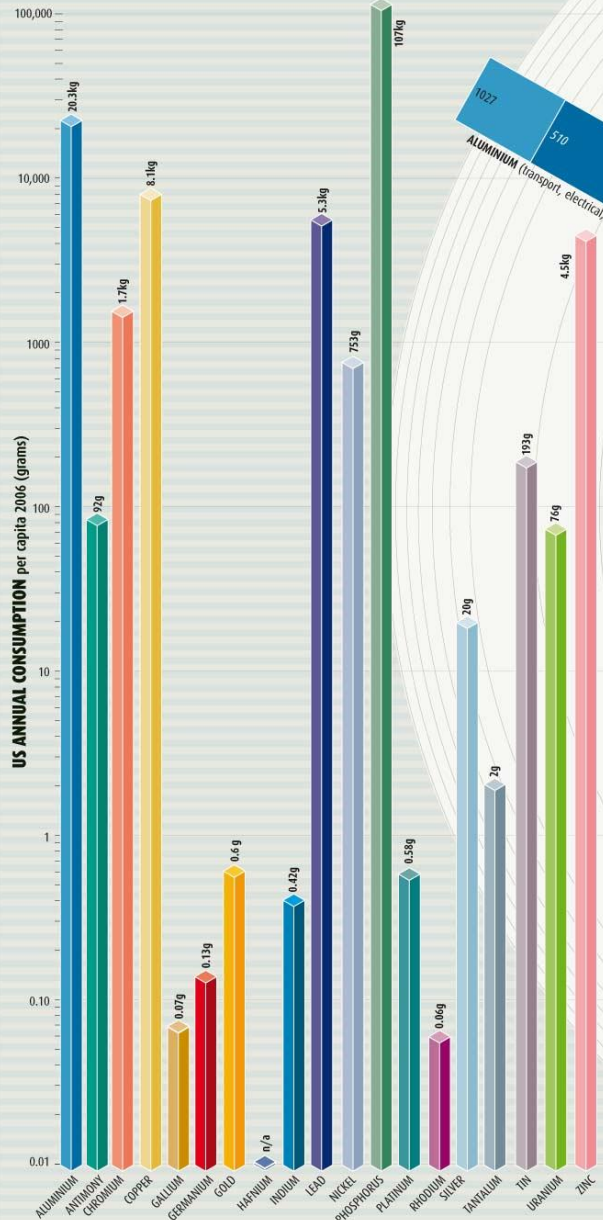
Reduce

Use as litt

Design

Design so
best that a

HOW MANY YEARS LEFT
IF THE WORLD CONSUMES AT TODAY'S RATE
58
Reserve base / Annual global consumption
(assuming global consumption=global production)

HOW MANY YEARS LEFT
IF THE WORLD CONSUMES AT HALF
THE US CONSUMPTION RATE
20
Reserve base
½ US per capita consumption 2006 x World population

Figures do not take into account changes in demand due to new technologies

ALUMINIUM (transport, electrical, consumer durables) 1027 510
CHROMIUM (chrome plating) 143 40
COPPER (wire, coins, plumbing) 61 38
ANTIMONY (drugs) 30 13
GALLIUM (LEDs, solar cells, lasers) n/a
GERMANIUM (infrared optics, semiconductors) n/a
GOLD (jewellery, dental) 36 45
HAFNIUM (computer chips, power stations) n/a
INDIUM (LCDs) 4 13
LEAD (lead pipes, batteries) 8 42
NICKEL (batteries, turbine blades) 57 90
PHOSPHORUS (fertiliser, animal feed) 345
PLATINUM (jewellery, catalysts, fuel cells for cars) 360 142 28
RHODIUM (X-rays) 9
SILVER (jewellery, catalytic converters) 29
TANTALUM (cellphones, camera lenses) 116 20
TIN (cans, solder) 40 17
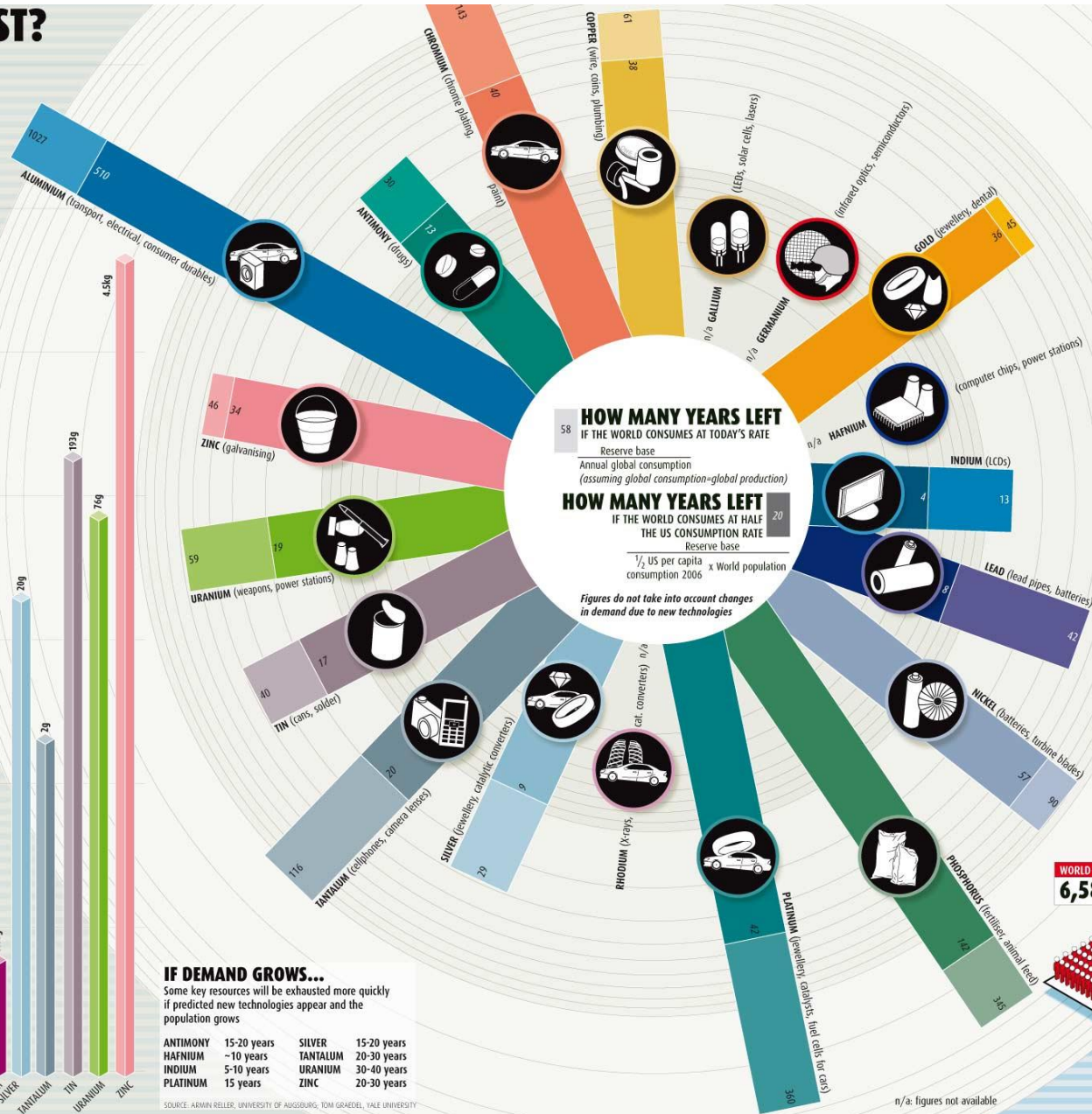URANIUM (weapons, power stations) 59 19
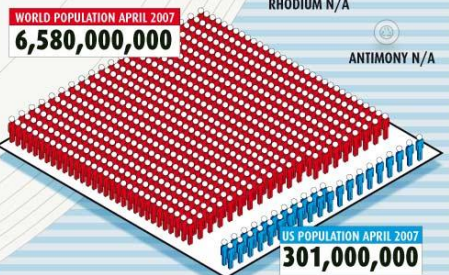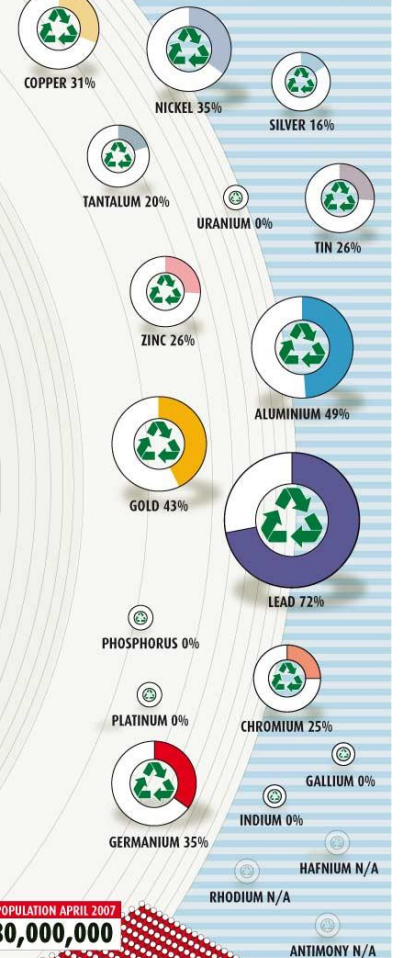ZINC (galvanising) 46 34

IF DEMAND GROWS...
Some key resources will be exhausted more quickly if predicted new technologies appear and the population grows

ANTIMONY 15-20 years
HAFNIUM ~10 years
INDIUM 5-10 years
PLATINUM 15 years
SILVER 15-20 years
TANTALUM 20-30 years
URANIUM 30-40 years
ZINC 20-30 years

SOURCE: ARMIN RELLER, UNIVERSITY OF AUGSBURG; TOM GRAEDEL, YALE UNIVERSITY

n/a: figures not available
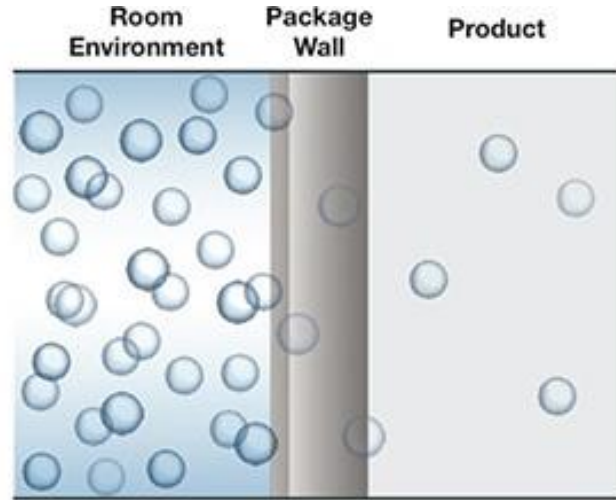
PROPORTION OF CONSUMPTION MET BY RECYCLED MATERIALS (%)

COPPER 31%
NICKEL 35%
SILVER 16%
TANTALUM 20%
URANIUM 0%
TIN 26%
ZINC 26%
ALUMINIUM 49%
GOLD 43%
LEAD 72%
PHOSPHORUS 0%
CHROMIUM 25%
PLATINUM 0%
GALLIUM 0%
GERMANIUM 35%
INDIUM 0%
HAFNIUM N/A
RHODIUM N/A
ANTIMONY N/A

WORLD POPULATION APRIL 2007
6,580,000,000

US POPULATION APRIL 2007
301,000,000
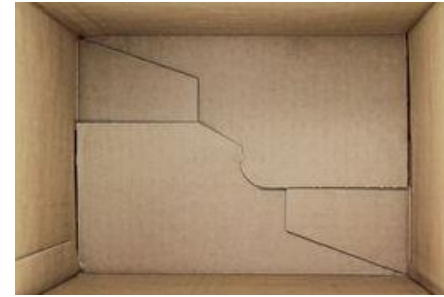
DETAILED SHAPE DESIGN: `FUNCTIONAL DETAILS
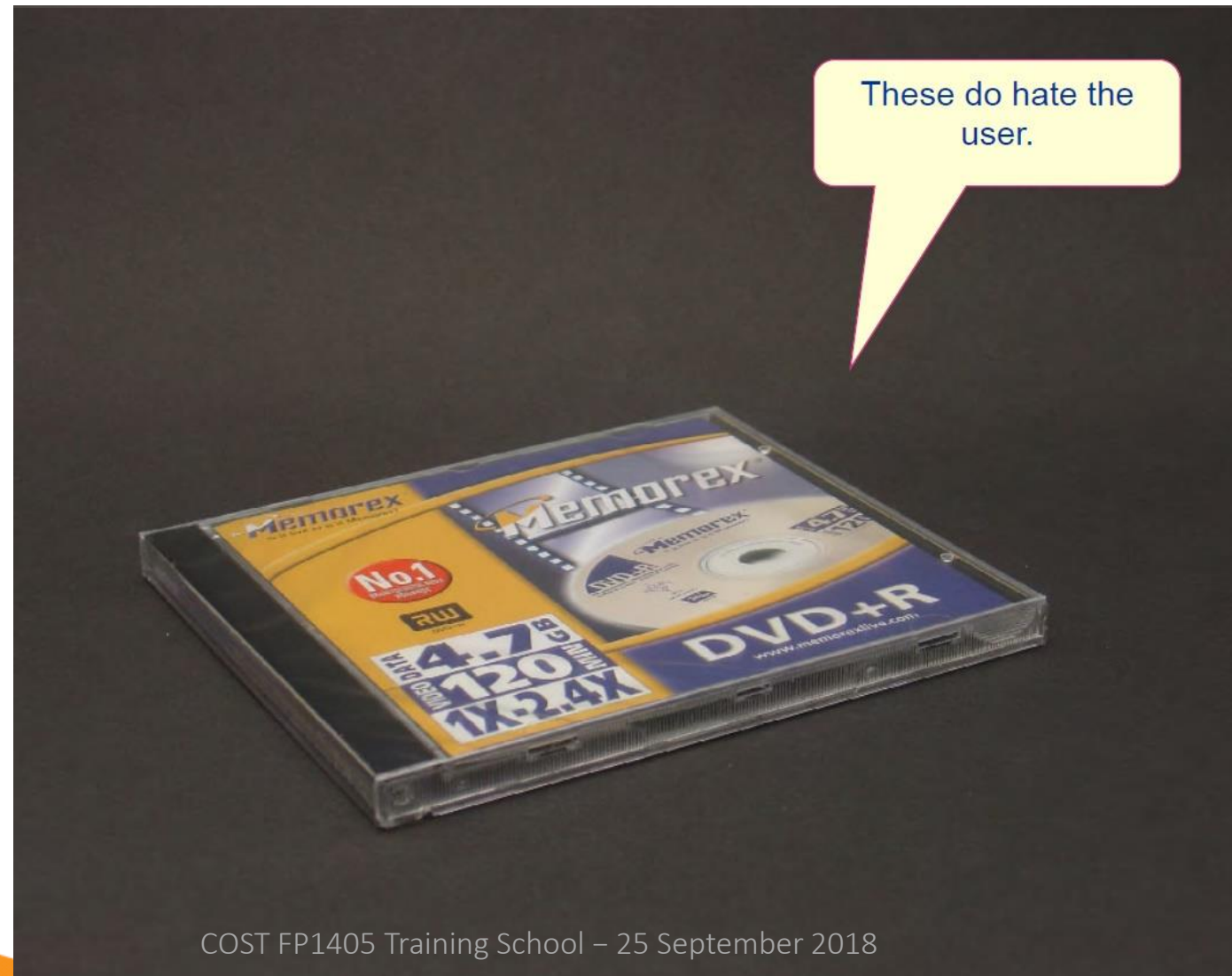
Material thicknesses

Closures

DETAILED SHAPE DESIGN: USABILITY

Usability = ensuring a product is usable by the target group.

For packaging this means that it can be opened:

- in a logical/intuitive way
- safely
- without damaging the product
- preferably without tools
- with as little actions as possible.

→ Ergonomics play a key role!

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| Idea generation | Concept development | Business cases | Detailed design | Testing & validation | Market introduction |

DETAILED SHAPE DESIGN: APPEAL & RECOGNITION

Color & shape are very important for recognizing a product!

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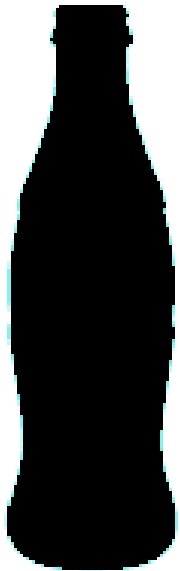
DETAILED SHAPE DESIGN:
APPEAL & RECOGNITION

Color & shape can thus be used to stand out... ...but not in all cases!

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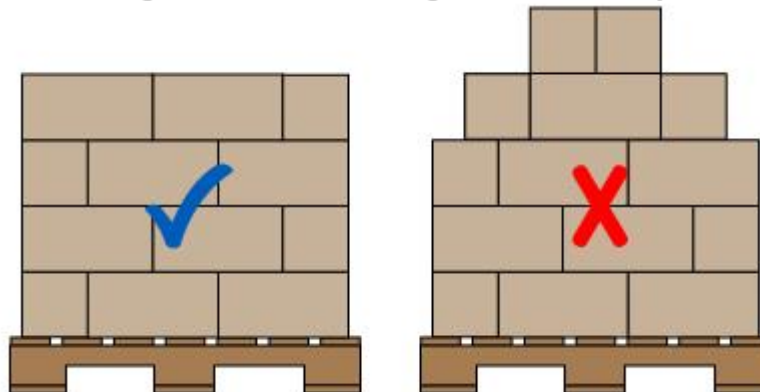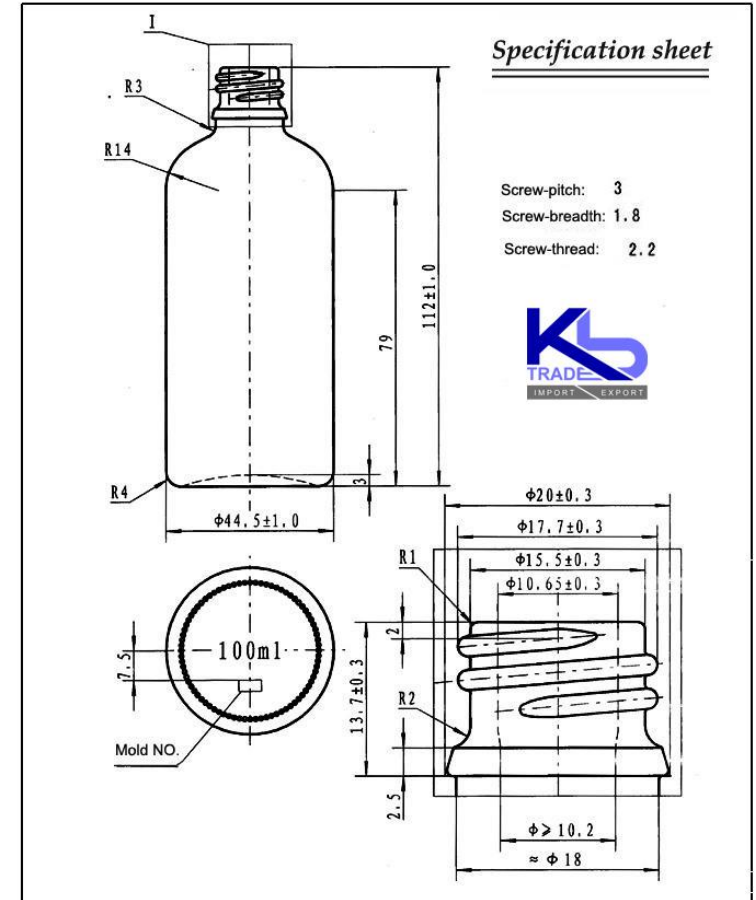
DETAILED SHAPE DESIGN: DIMENSIONING

Preparation for prototyping & production
→Include tolerances

Consider secondary & tertiary packaging
→ collomodule system; properly stacked
pallets result in less damage during transport

Specification sheet

Screw-pitch: 3
Screw-breadth: 1.8
Screw-thread: 2.2

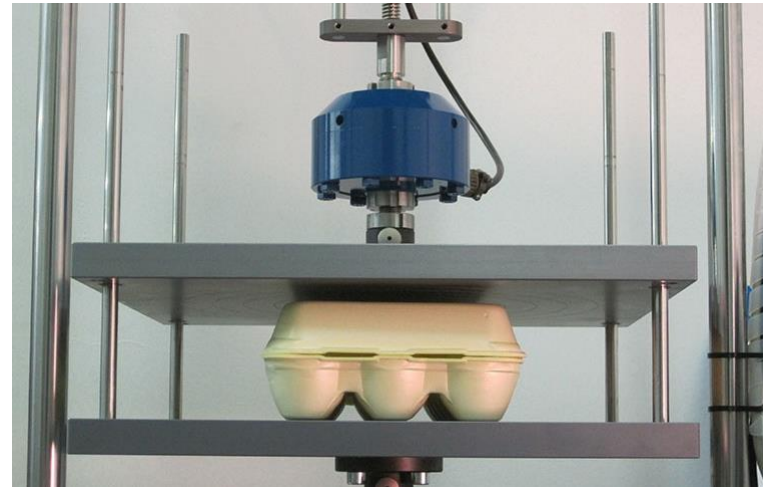| Filling Cap.: | 100ml | DES'D by | Date: | REF. NO.: | 491001 # |
Brimful Cap.:	105±3ml	CHK'D by	Date:	DRG. NO.:	100ZMD
				Material	Essence oil bottle, Type III
Weight:	Around 88g	APP'D by	Date:		Made of Soda-lime Silica Glass

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STAGE 5:
TESTING & VALIDATION

TESTING & VALIDATION

Testing the design to evaluate its usability, consumer appreciation as well as technical functionality (i.e. barrier properties).

The goal is to identify possible errors so that the design can be adapted before product launch.

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TESTING & VALIDATION

Communication *is* **key!**
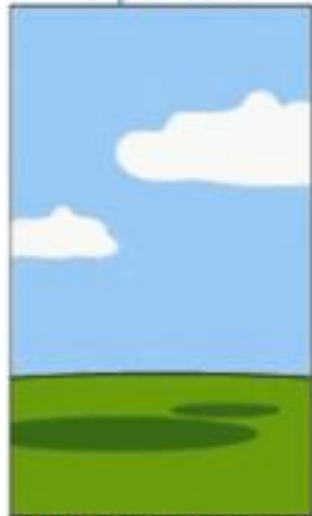
STAGE 6:
MARKET INTRODUCTION

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MAKE MONEY!

THANK YOU!

ANY QUESTIONS?

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