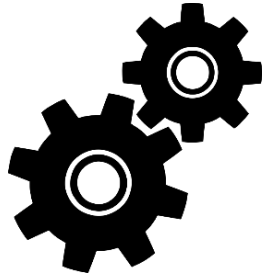


Design for transformation

James Moultrie

Colin Haden (presenter)

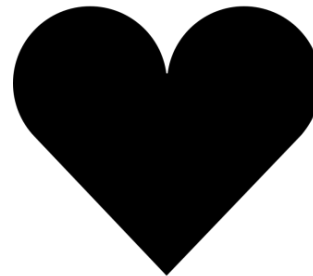
Why design matters?



Functional

What it does:

Functions
Performance
Production
Reliability
Robustness



Emotional

*How it
makes me
feel*



Social

*What it says
about me to
others*

*brand, image,
messages*

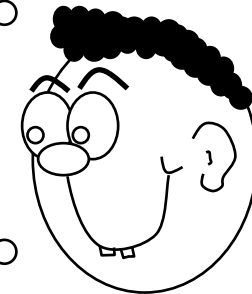
How does it make me feel?



Social Emotional



Experience

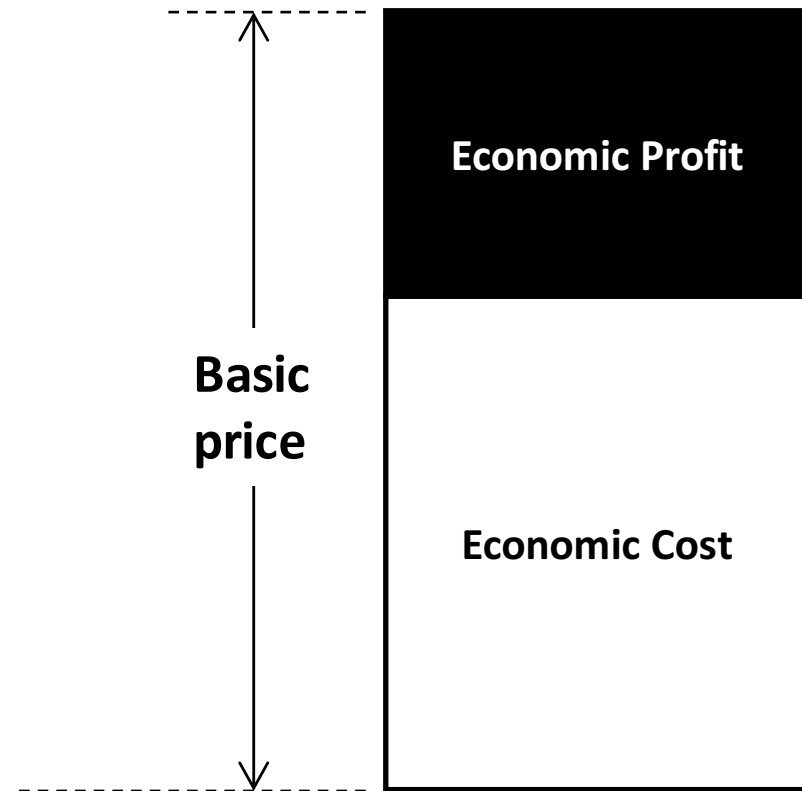
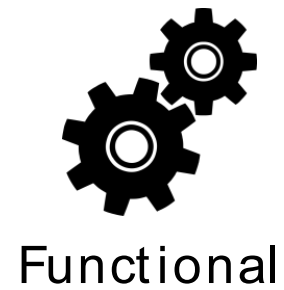


What does it do?

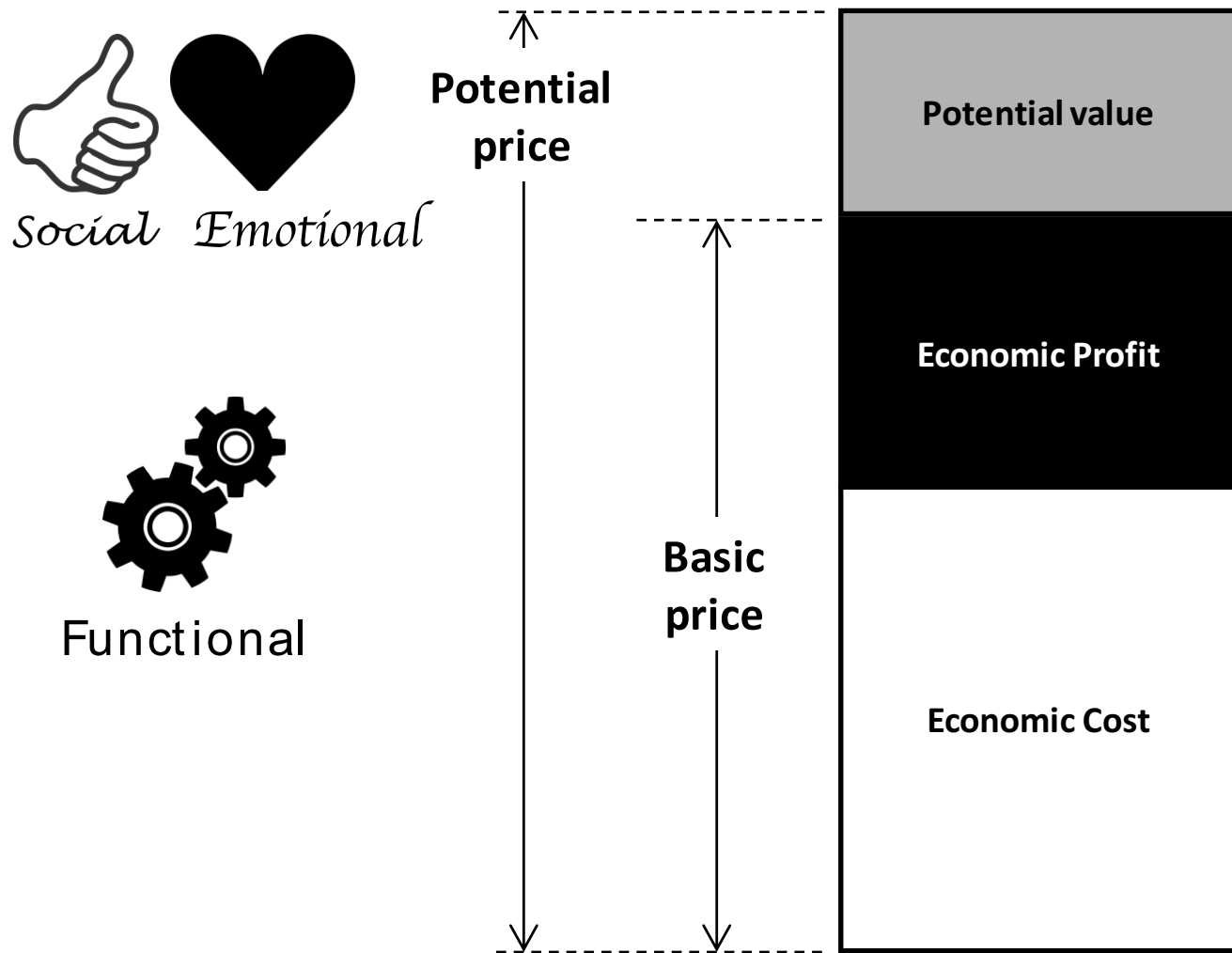


Functional

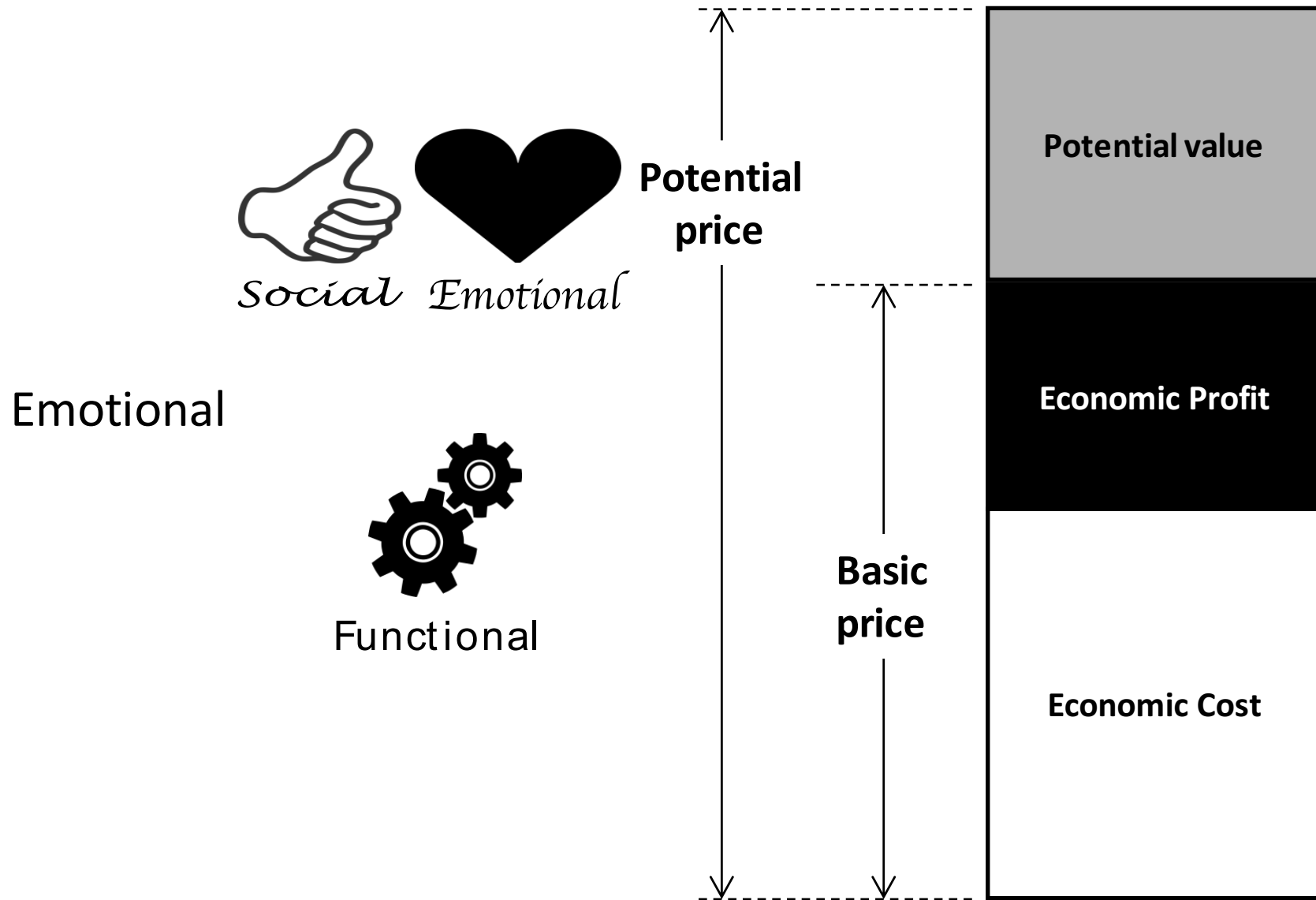
Value ...



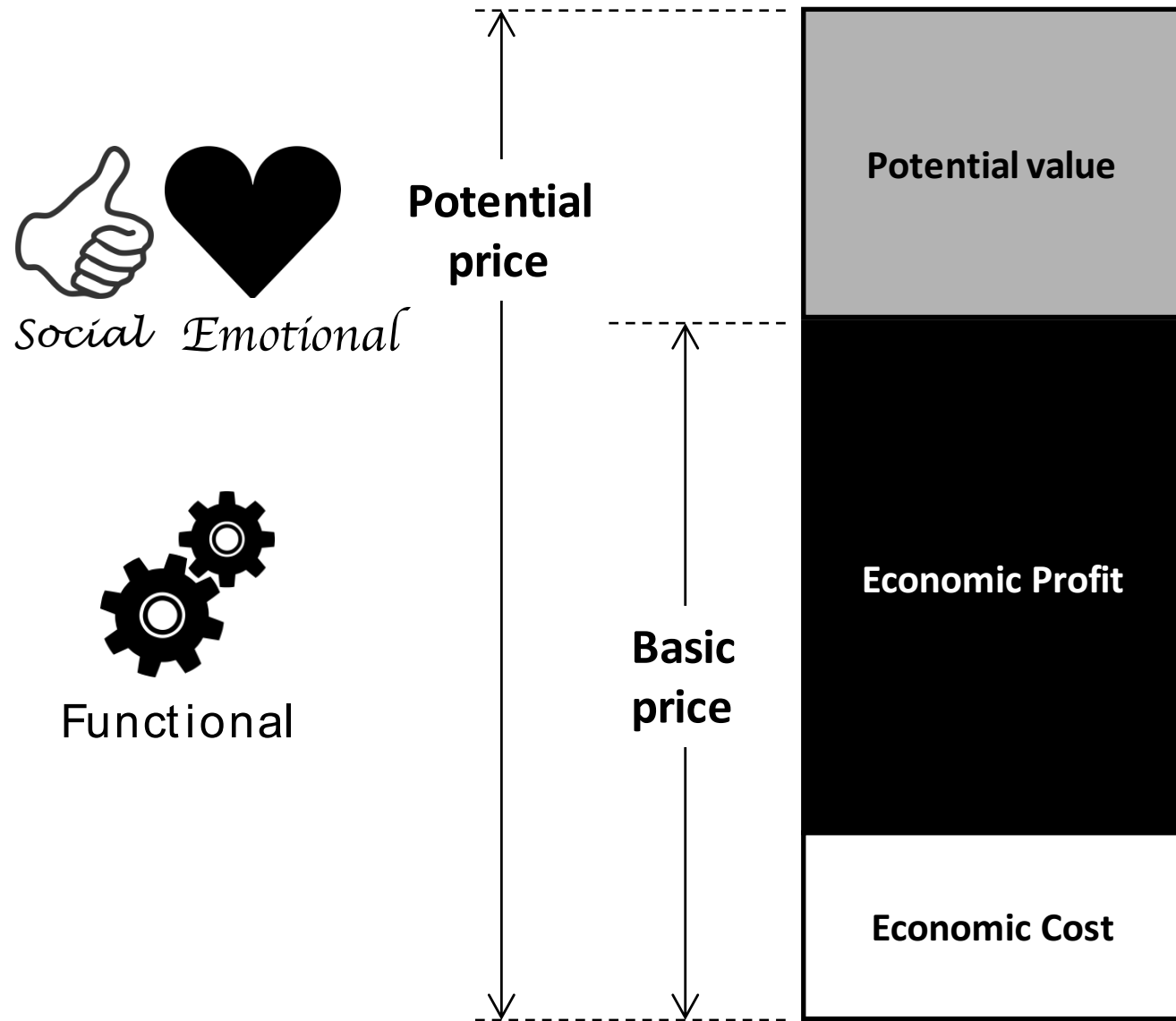
Adding value ...

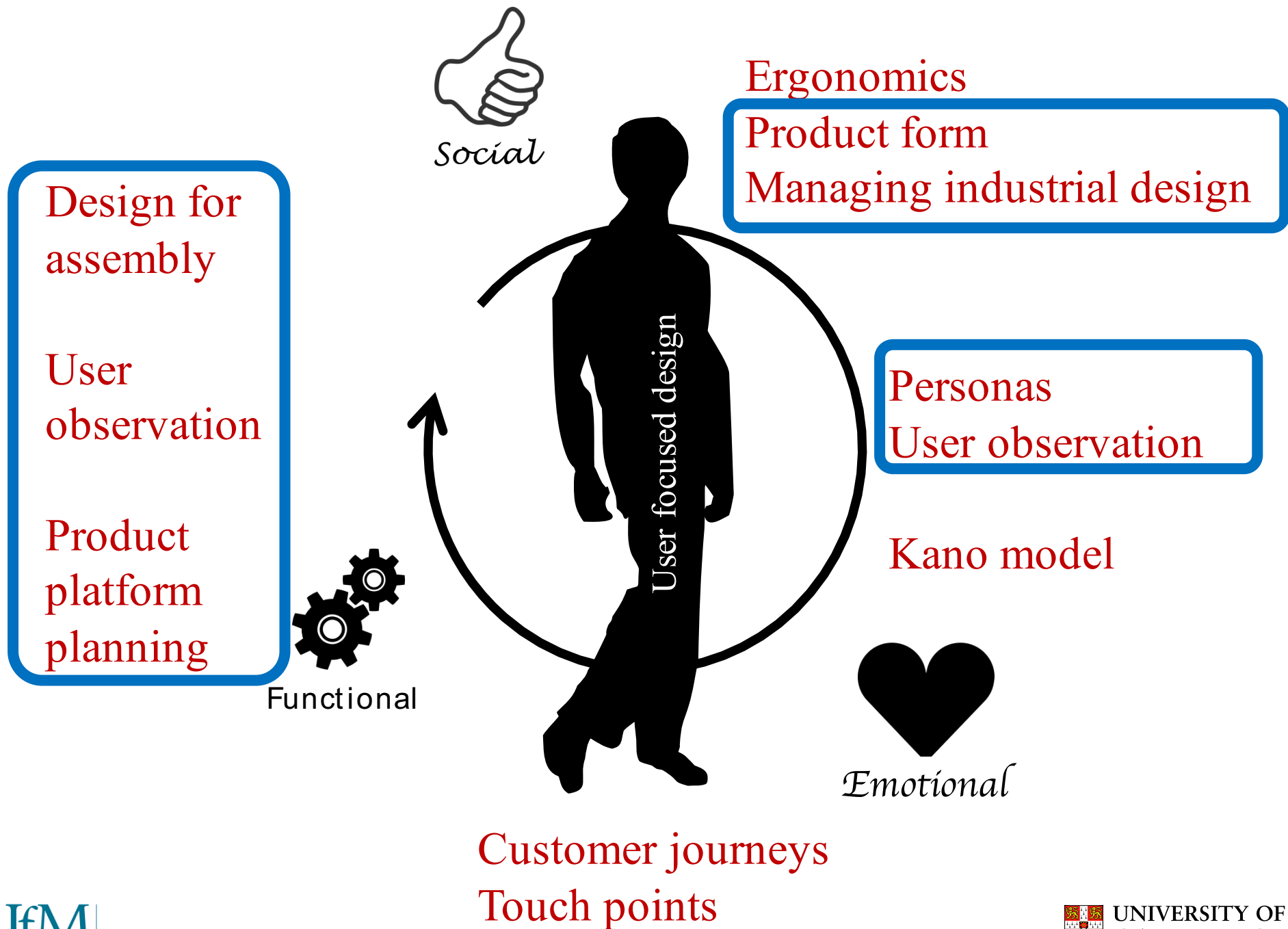


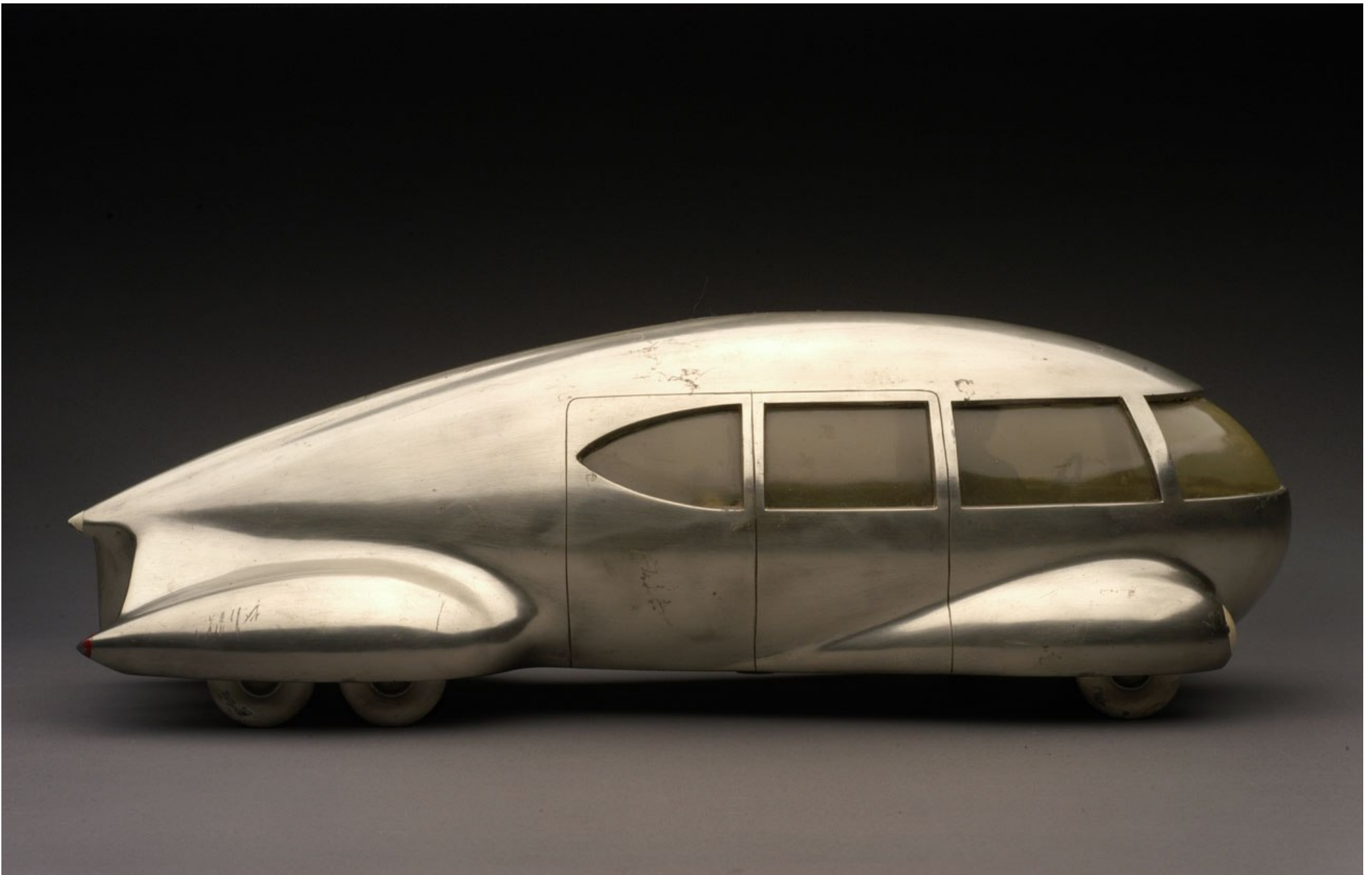
Great design



Great design







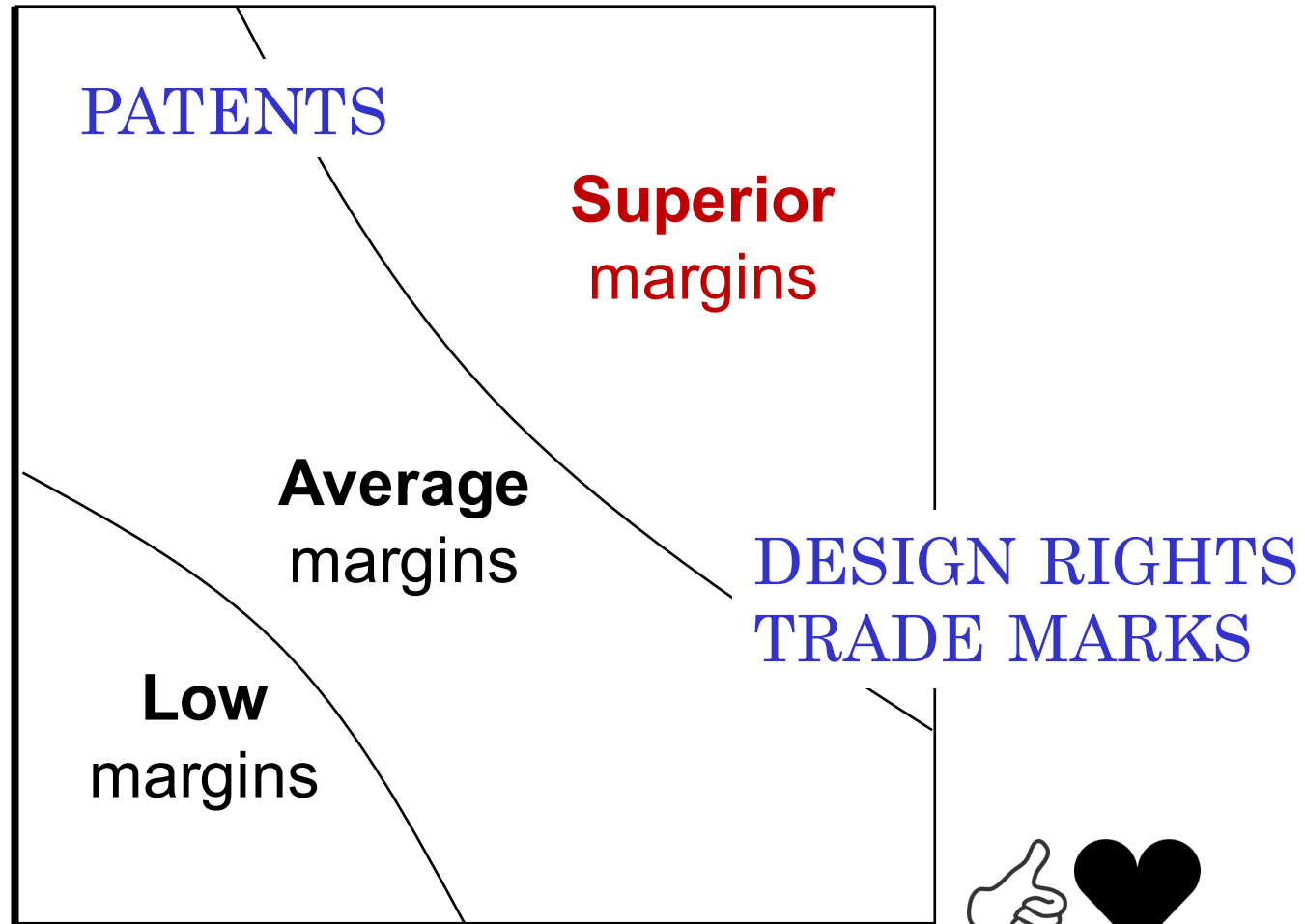
Bel Geddes Prototype car, c. 1933

<http://www.worldarchitecture.org/blog-links/pvpfn/a-new-look-at-modernist-hero-norman-bel-geddes-designer-of-the-original-1939-futurama.html>


Functional



 
Social *Emotional*





Health
returns with
LUCOZADE

“She’ll soon be up and about again!”...

It’s a tragedy when mother’s ill—but her illness can be so much shorter if Lucozade is there to help. Lucozade contains Glucose to provide energy when it’s needed most, rallying the sick and speeding the convalescent. And how acceptable it is! The sparkling Lucozade flavour stimulates the appetite and makes it acceptable even in cases of extreme exhaustion. But don’t wait for illness, help to protect yourself and your family by keeping really fit. Have some Lucozade in your home—and ask for it wherever you go. *Used by Doctors and Nurses in Hospitals, Clinics and Schools.*

We receive letters like this every week

It’s a wise housewife who keeps some Lucozade in the house—and here’s a letter from one: “I had an operation ten weeks ago and for a month after I came out of hospital I felt like nothing on earth... Then one day my husband brought home a bottle of Lucozade and from the first bottle I felt better.”
Mrs. Gladys Sumner, Forest Hill, London.



LUCOZADE
the sparkling glucose drink

REPLACES LOST ENERGY

LUCOZADE LTD., GREAT WEST ROAD, BRENTFORD, MIDDLESEX.

royals 1731/4/53

Lucozade

the sparkling **GLUCOSE** *drink*

**replaces
lost
energy**

Lucozade
is used by
**DOCTORS AND NURSES IN
CLINICS HOSPITALS
NURSING HOMES & SCHOOLS**

LUCOZADE LTD., GREAT WEST ROAD, BRENTFORD, MIDDLESEX.

June 27, 1953

Meta product: Brand, Business model, Strategy, Production system

Augmented Product: Service & support, Finance and warranty,
Delivery, Installation



Social

Core Product: Tangible and intangible product attributes



Core benefits

- > Need
- > Functionality
- > Alternatives
- > Value

Usability

- > Getting started
- > Interface clarity
- > Physical usability
- > Maintenance & cleaning

Desirability *Emotional*

- > Aesthetics
- > Symbolism & status
- > Visual clarity
- > All senses
- > Pride
- > Emotional response

Engineering Quality

- > Performance
- > Reliability
- > Build quality
- > Durability



Functional

Producibility

- > Component manufacture
- > Assembly & test
- > Platform strategy

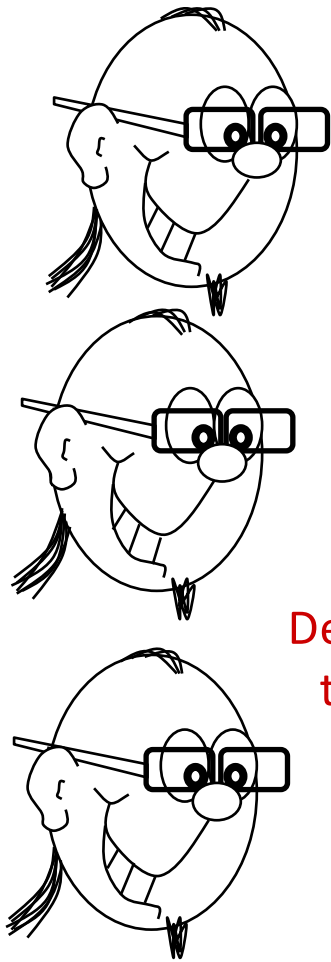
...design is complex...

User focussed design

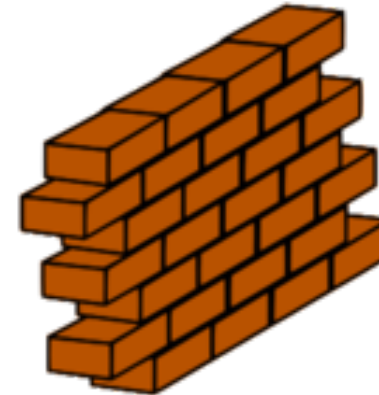




Marketing



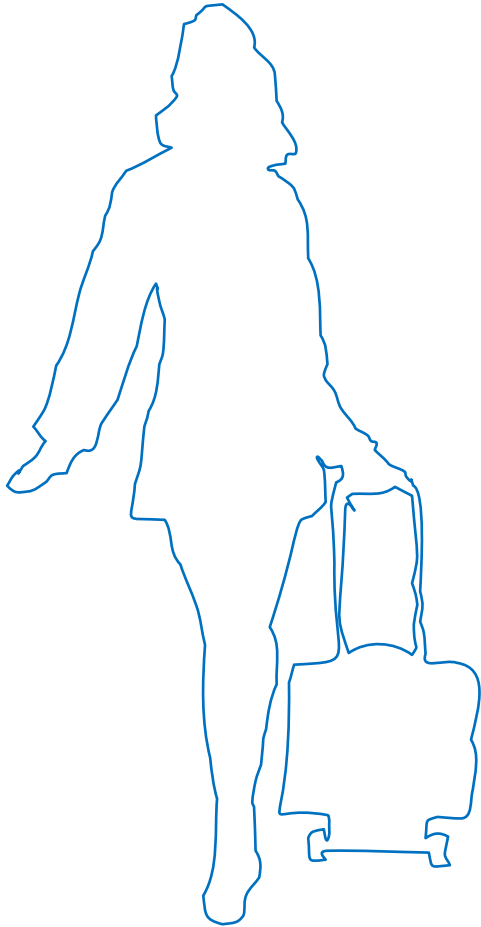
Design
team



User

Designers are good at designing for themselves
But, designers are **not** representative of the intended audience
Engineers even more so!
By referring to Personas designers can ensure that they are not
just designing something they like.

Personas



Luggage for a flight attendant



Personas

Name

- Fiona Outline

Background

- 35 year old business studies graduate (1991, Oxford).
- Recently left an accountancy firm to retrain as a cabin crew.
- Typically flies from UK to EU twice a day. Serves customers, liaises with cabin staff and captain.
- Lives with partner in a 15 year old 3 bedroom house in the outskirts of Cambridge.
- Would like a family at some point.
- Loves travelling but finds packing and unpacking a real chore
- Reads 'thriller' novels
- Loves the new(ish) ilni or MX5, but can't afford one

Goals

- To get on and off the plane as quickly as possible
- To hold enough for an overnight stay: including shoes
- To minimise time packing and unpacking
- To present a professional corporate image to customers
- For customers to think that the airline is up to date
- To look cool



To help evaluate proposed concepts-
Q. How would "Fiona feel"?



To help generate ideas & solutions

Rules for creating useful personas

1. Keep them simple and memorable
2. Each one has distinctive goals, not behavior or tasks
3. Add a little personal detail, but not so much they appear phony or silly
4. Focus on 3 or 4 goals per persona
5. Create personas in context of a specific project
6. Keep your persona set small
7. There is not a direct correlation between market segments and personas

Who are the stakeholders ?

Internal stakeholders

- Marketing
- Engineering
- Service
- Sales
- Accounts / finance
- Assembly
- Production
- Purchasing
- Production control
- etc



External stakeholders

- Customers (purchaser)
 - Airport managers
 - £1m+
- Users
 - Security staff
 - General public
 - Police
- Suppliers
- Distributors
- Subcontractors
- Point of sale
- Installation
- Legal bodies
- etc

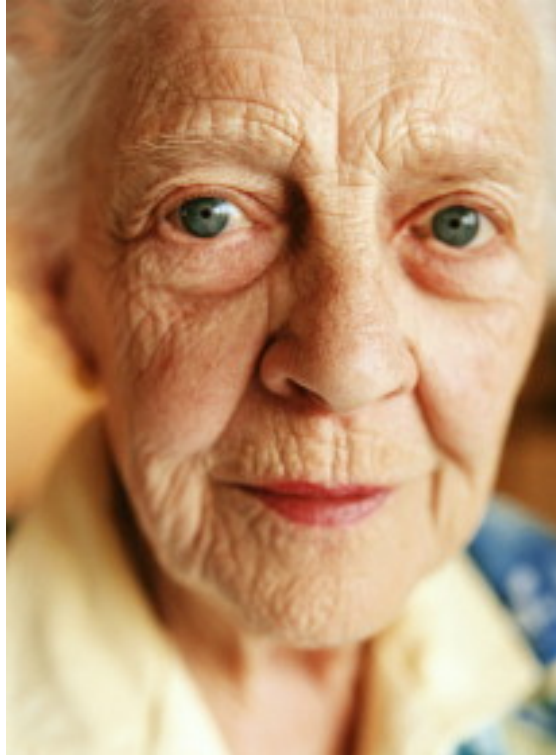
What is typically included ...

- **Personal profile**
 - Age, sex, education, job, hobbies, family, socio-economic group, etc
 - Job role for work-centred sites
 - Position in household for home-centred sites (eg mother)
- **Some believable detail**
 - Lifestyle, health, likes and dislikes, family, etc
 - To make them a believable person
 - To help the designers have empathy with them
 - Normal people, not caricatures

Goals ...

- Understanding user goals are essential to developing products
- To be effective personas must have **goals**:
 - Life goals
 - Experience goals
 - End goals

Example: A new kettle



Scenario: She can't use the new kettle that she was bought

- Life goals
 - To not be lonely
 - To stay healthy
 - Avoid frustrating technology experiences!
 - Not be reliant on anyone
- Experience goals
 - To not have to read the instructions
 - To fill it easily
 - Not to have to carry anything heavy
 - To be able to clearly see how full it is
 - To not have to ask how to use it
 - Buttons that are easy to press and don't need much force
- End goals
 - Be able to have a cup of tea

Persona template

Photo	Name	Goals	Experience	Behaviours
	Profile			
			End goals	
A typical day			Corporate goals	
An ideal 'day' in 5 years time		Reference points		



Name SURYA VEER SINGH

Profile

- (A) Age - 42 yrs.
- (B) Degree in aviation Science.
- (C) 10 yrs. experience in at Chandigarh airport.
- (D) Seen changing face of IGI Airport in last 8 years.
- (E) Comfortable with computer Usage.
- (F) Loves to be in control
- (G) Loves to be dressed smartly.
- (H) Married with two school going kids.
- (I) Likes his drinks in evening

A typical day

- (A) 3 peak periods of 2 hours each with one in non office hours.
- (B) 2-3 VIP movements which he needs to attend to.
- (C) Handle one equipment failure reports.
- (D) Resolve multiple priorities / crises
- (E) Dealing with irate customer / staff.
- (F) Make closing report of day and day ahead planning.
- (G) Routine operations and workflow management. (flight, passenger, luggage etc.)

An ideal 'day' in 5 years time

- (A) No crises throughout the day.
- (B) Able to handle doubled traffic & enhanced security threat
- (C) Complete flow system monitored and controlled automatically by I.T system
- (D) Things happening "Consistently & easily"

Goals

- (A) No complaints of delaying queues by airline staff.
- (B) Smooth flow at airport despite high passenger throughput.
- (C) No overstressed staff.
- (D) No crisis phone call / messages. (consistent & easily).
- (E) No queue longer than 5 minutes
- (F) Zero security lapses.
- (G) Hassle free customer experience.
- (H) Optimal resource utilization.
- (I) No equipment down time
- (J) Hassle free handling of special cases (disabled, medical, VIPs, etc)
- (K) Best airport security handling with lowest opex.

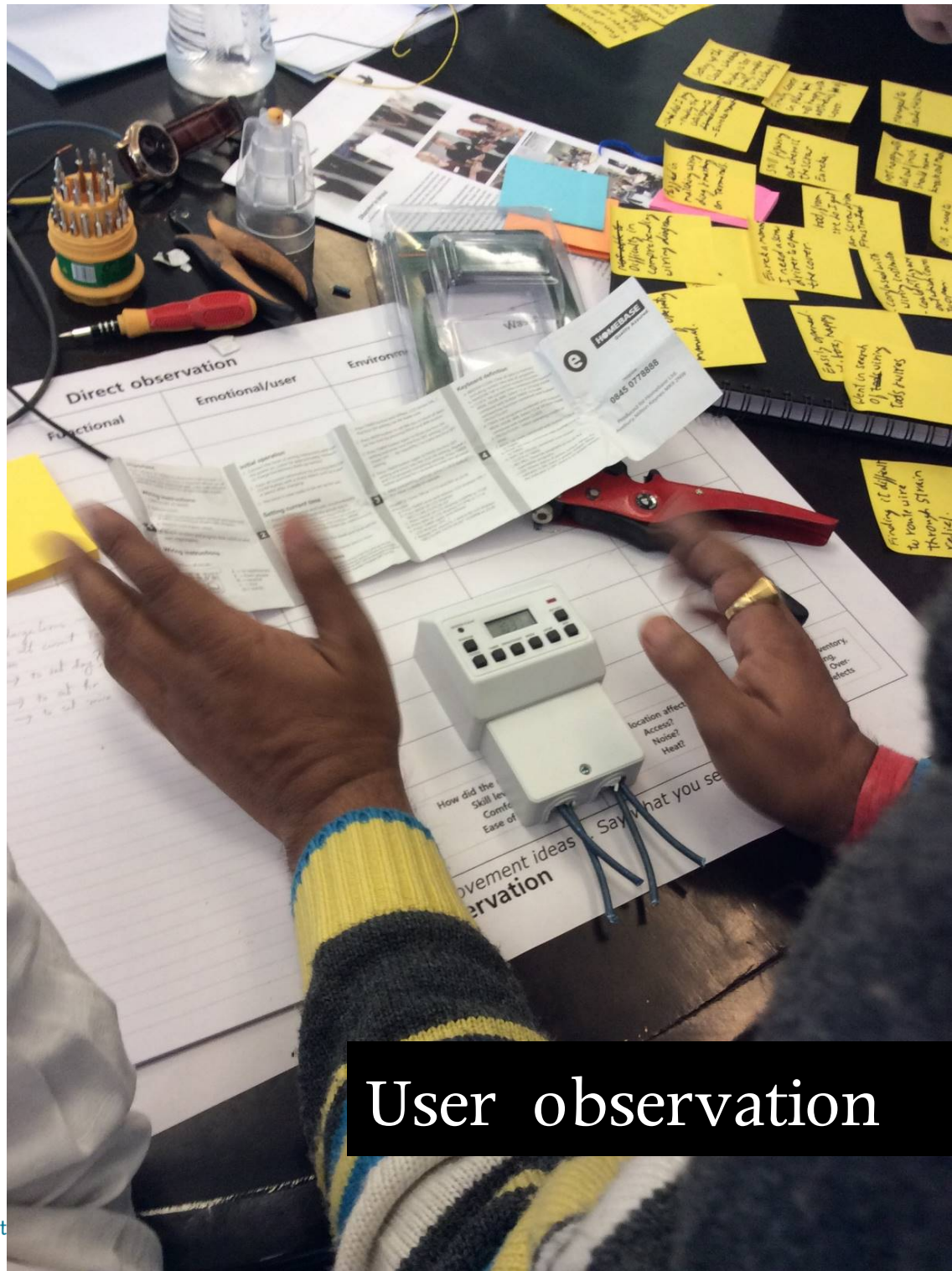
Experience

- High Reliability
- Not replaceability
- Fast Scan
- Reliable Scan
 - Intelligent image identification
 - Auto alert & Pax
 - Pax profile linked to Intelligent data base
- Low Opex
 - Minimal manual intervention
- Self diagnostic Alert
- Minimal space 5' channel width
- Easy to use

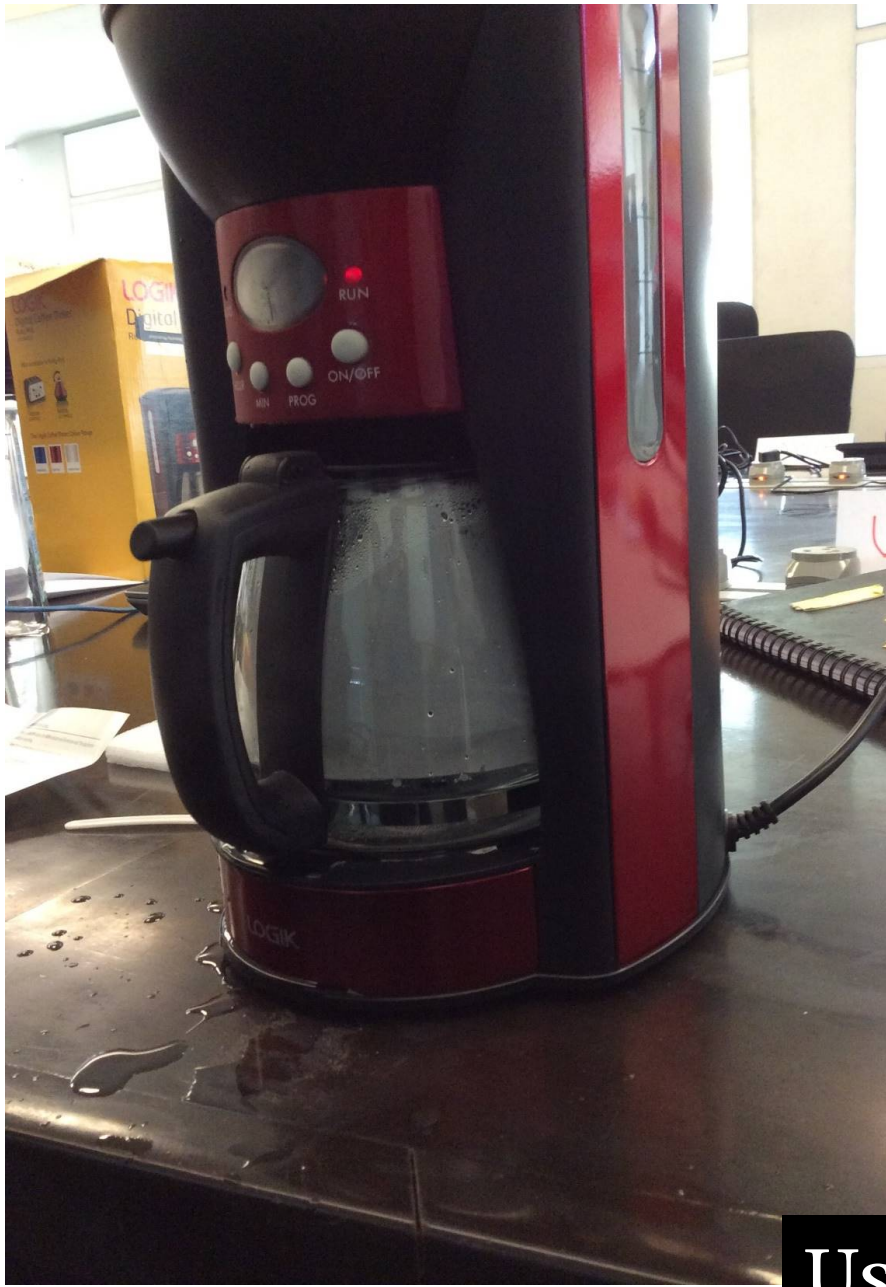
Reference points

- Walki-talkie in hand
- Calm but authoritative
- In business coat / blazer

Developing personas



User observation



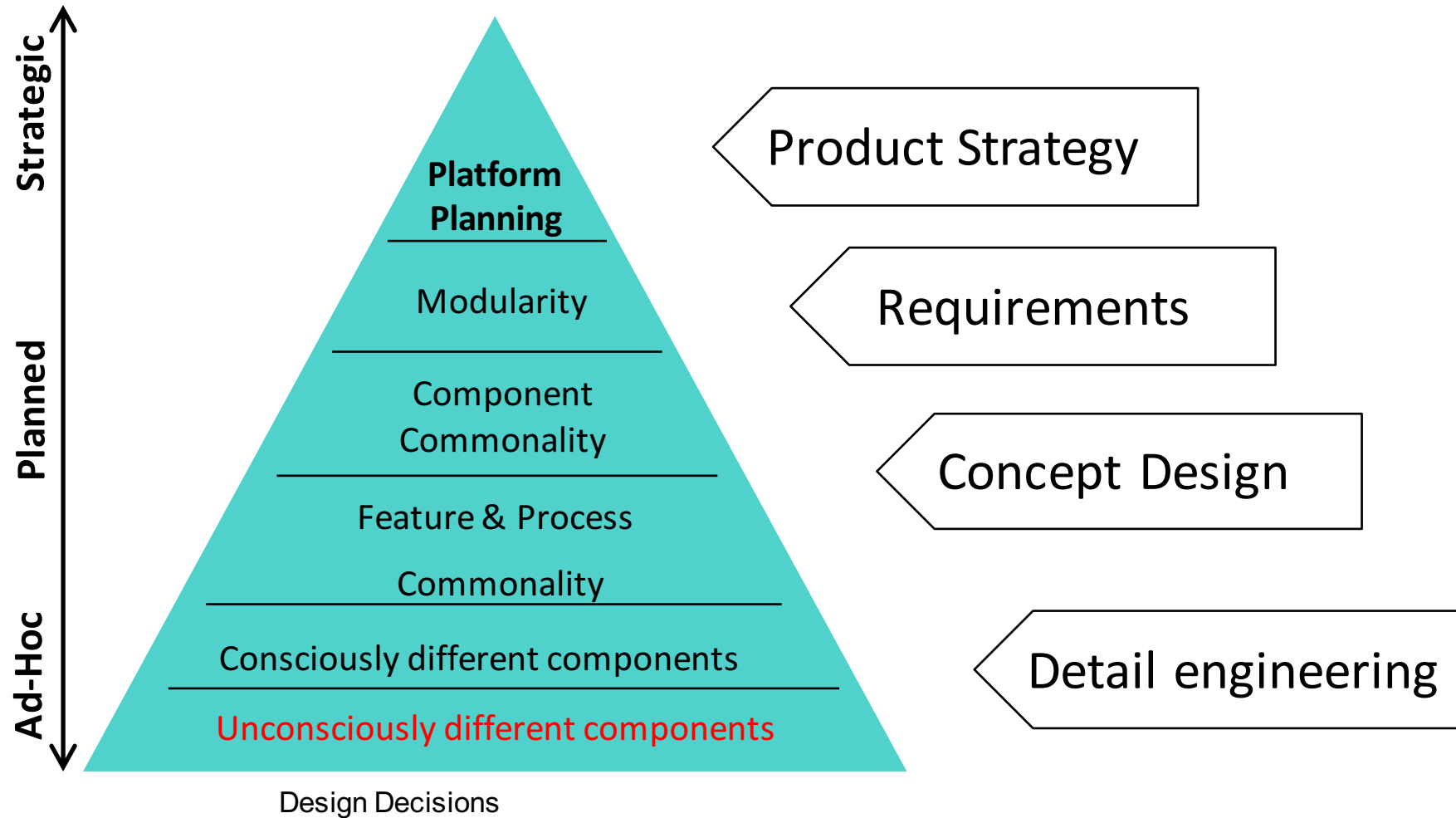
COFFEE MAKER

TASK + TIME	TECH + PERFORMANCE + FUNCTIONAL	EMOTIONS + USER	ENVIRONMENTAL	WASTE
08:10 Open the box with the coffee maker	08:10 Open the box with the coffee maker	08:10 HAPPY WITH PACK DESIGN NOTICE THE FACTOR FLAPS THAT DON'T HAVE MANUAL		
1:30 Take out the machine - left out the manual	1:30 Take out the machine - left out the manual	1:30 Difficult in taking out the glass jar alignment		
02:30 Bit confused in middle	02:30 Bit confused in middle	02:30 MACHINE IS PACKED IN UPSIDE DOWN DIR. MANY ACCESSORIES COMPLICATED		
03:10 Went back to report the main issue - not safe to use	03:10 Went back to report the main issue - not safe to use	03:10 Problem in Jar (Convenience) where to pour the water??		
04:10 Scale on the machine	04:10 Scale on the machine	04:10 CONFUSION OVER WHERE TO POUR THE WATER		
10:40 Cleaning up the water spillage	10:40 Cleaning up the water spillage	10:40 14:49 Water spillage		
17:52 Again water spillage	17:52 Again water spillage	17:52 20:16 Timer display became hazy (steam)		
22:49 User program again with no do report	22:49 User program again with no do report	22:49 24:00 Coffee maker program that not self explanatory		
32:00 No indicator when to stop pour	32:00 No indicator when to stop pour	32:00 User Feedback NOT INTUITIVE		
33:00 Prog support AUTO mode is increased/better	33:00 Prog support AUTO mode is increased/better	33:00 Jug was not shown how to use		
		33:00 DIS-SATISFIED USER!!		
		33:00 JAR FELT HOT TO USE		
		33:00 USER NOT HAPPY WITH THIS M/C		
		33:00 COFFEE SMELLS UNDESIRABLE (USER PLATE)		
		33:00 DIS-SATISFIED USER		

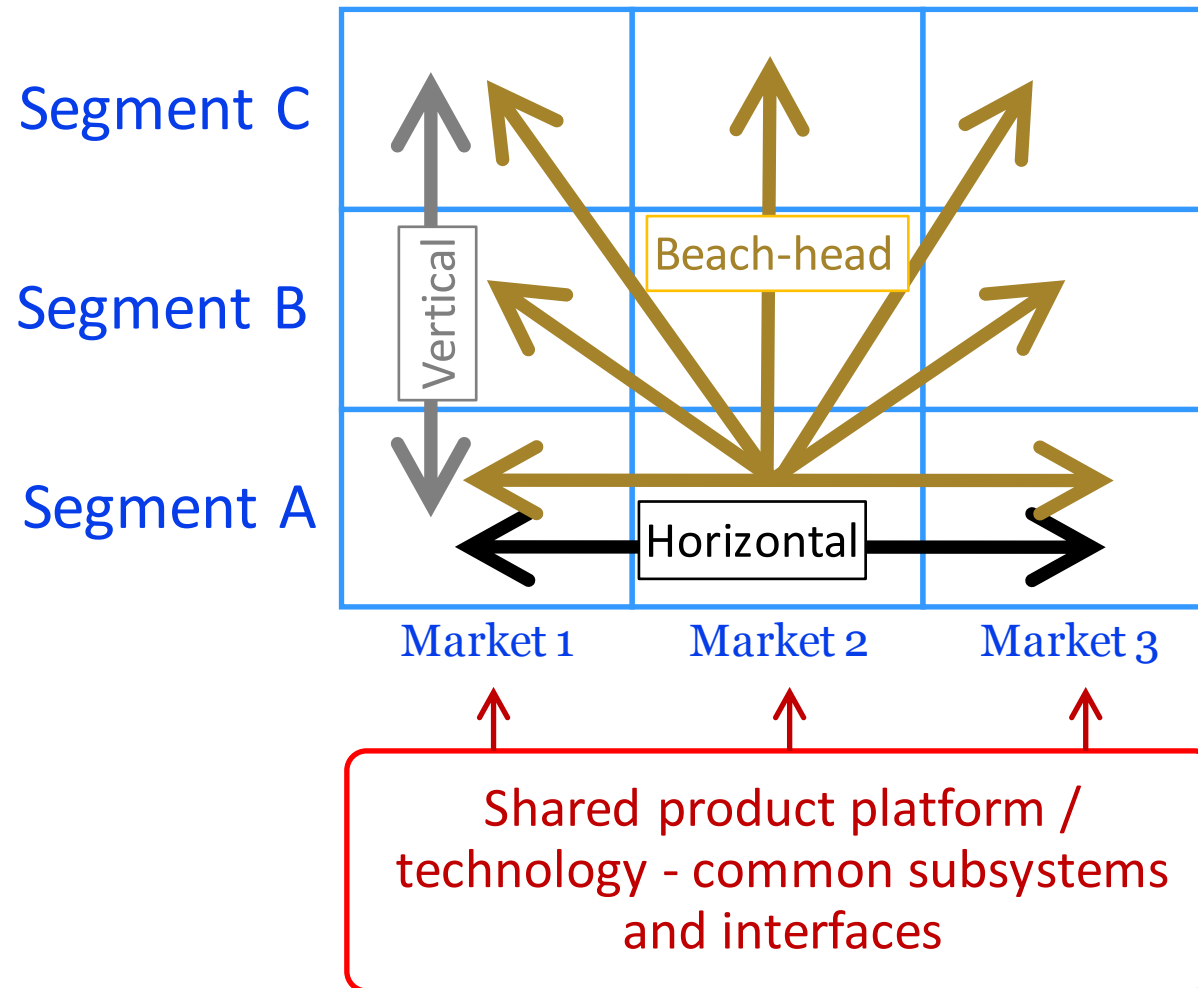
User observation

Product planning

When to consider platforms...



Product platform - Leveraging ...



Reuse of platform elements **within** a market and across segment

Example - Black & Decker cordless ...

Industrial



Horizontal
leverage of
battery
technology

Domestic

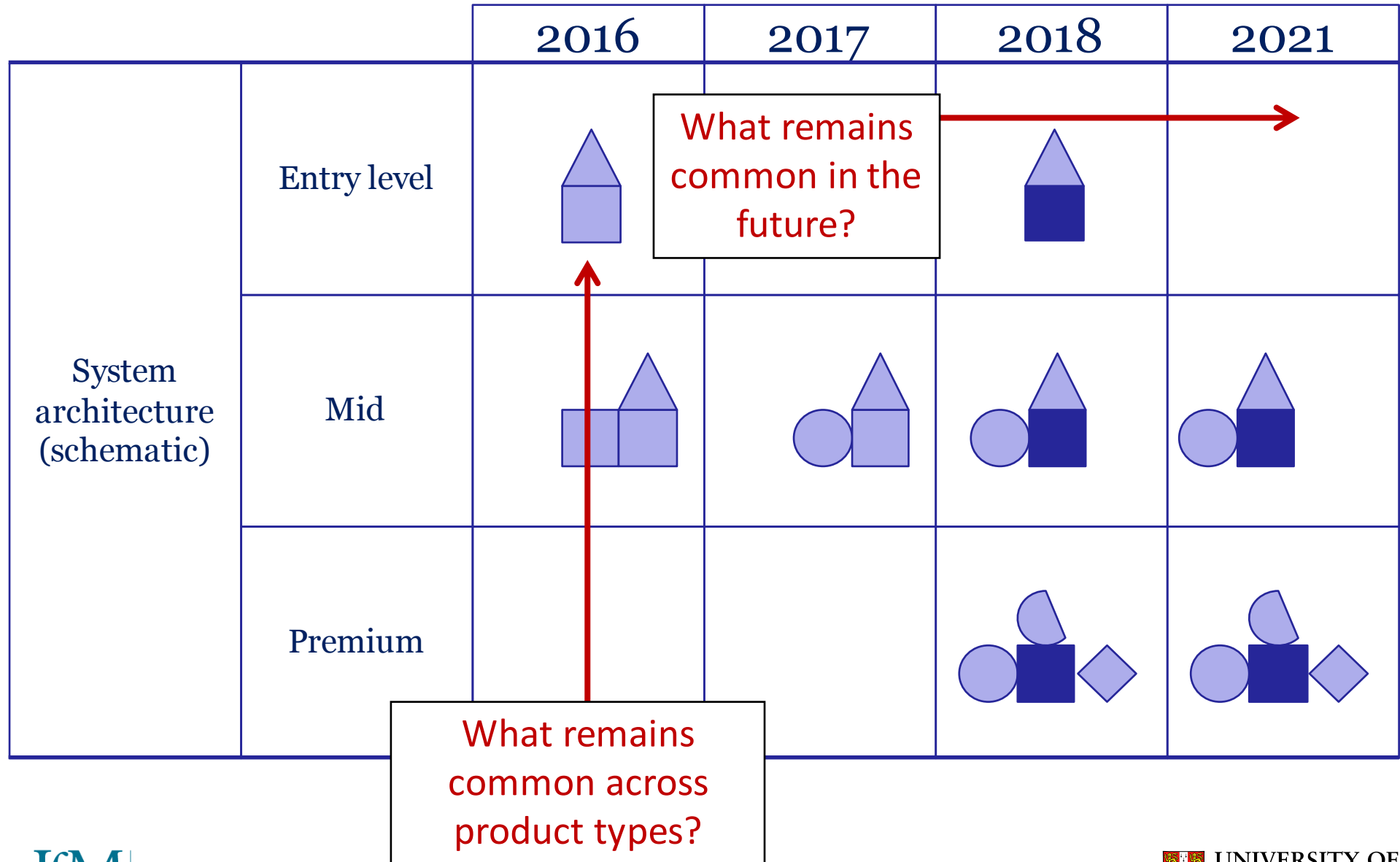
Saws

Drills







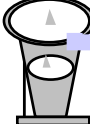
Lighting

Battery technology

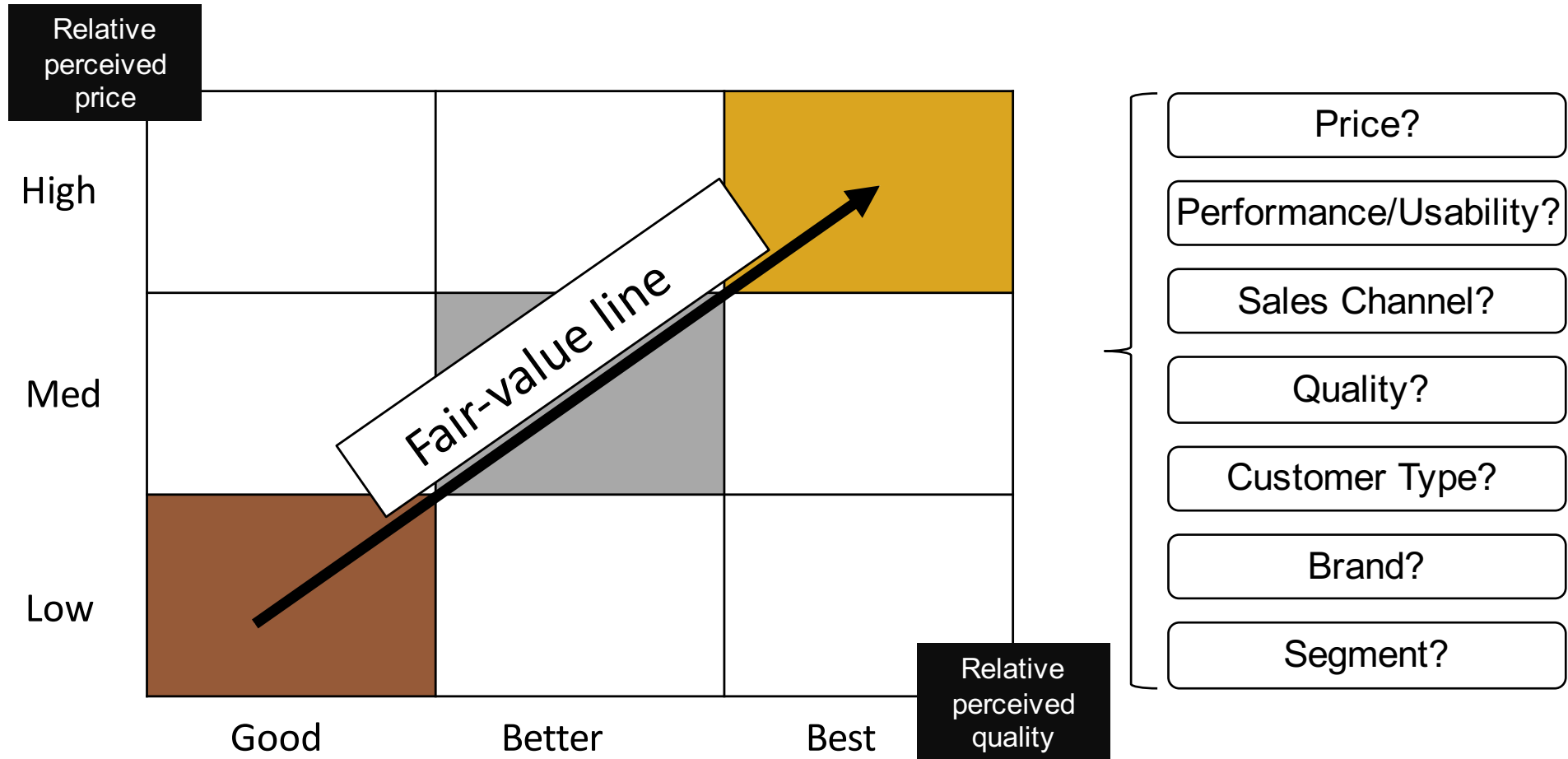
Product system architecture



Product platforms have to be managed

	Today	Short Term 2016-18	Next stage 2018-2020	2020+ advanced	Outlook
Basic	>x% 	→	X		N/A
Protection	>y% 	→	X		The new "basic"
Usability	No current offer		→		New standard
Integrated	< z% 	→	X		Niche

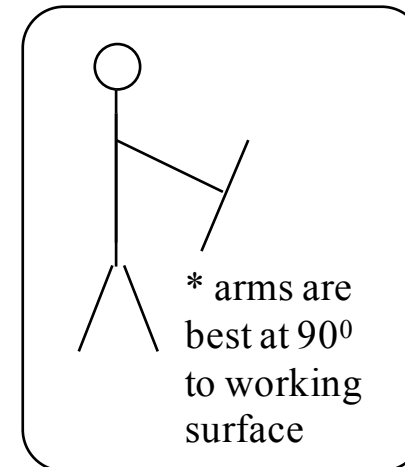
Product positioning



Design for assembly?

Optimising an assembly - Heuristic principles

- Minimise components
- Use open enclosures
- Don't fight gravity
- Assemble from a single direction
- Use a stable base
- Don't over constrain
- Design out wires and cables
- Avoid the need for holding
- Test the sub assembly
- One orientation*



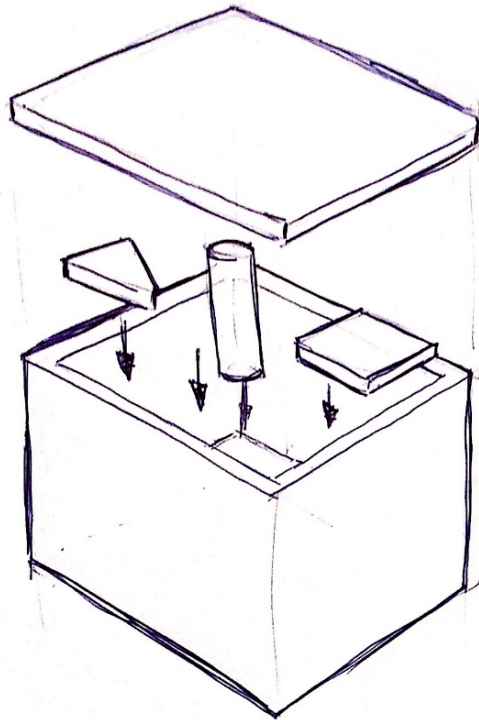
some key questions:

- Does everything need to be fastened?
- Is every part needed?
- Are they easy to handle?
- How easy are they to fix?

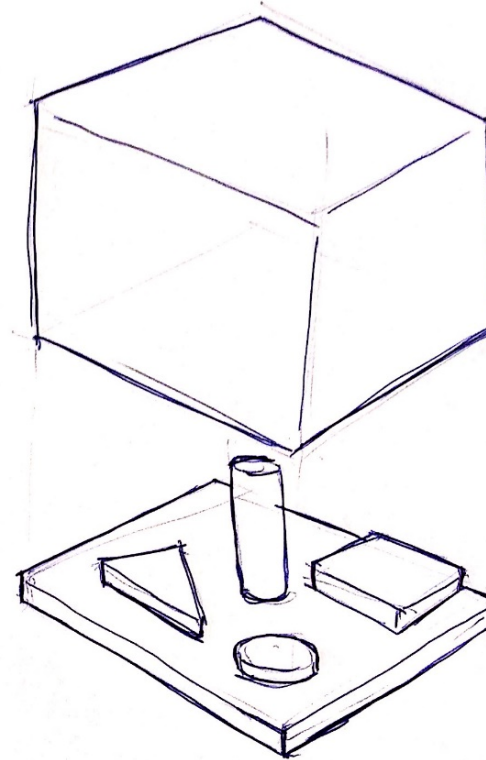
+ collaboration across the organisation

Open enclosures

Difficult access, parts hidden and not easily accessible

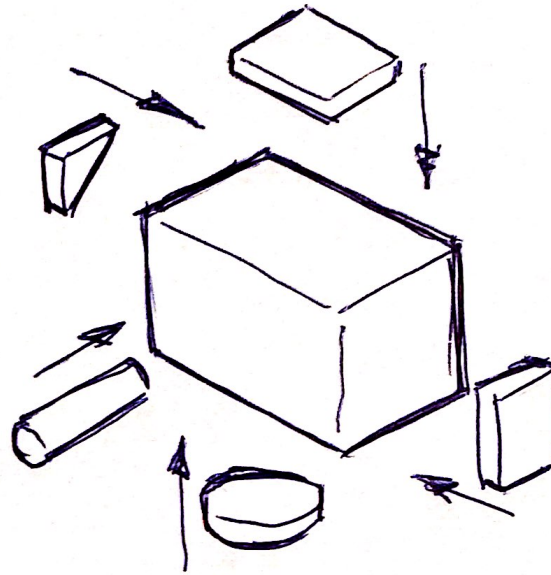


Components all visible and accessible

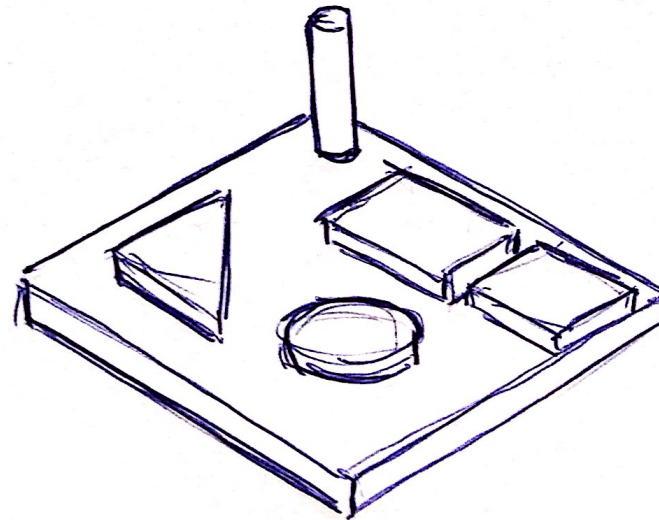


Don't fight gravity

Parts
assembled
from all
directions

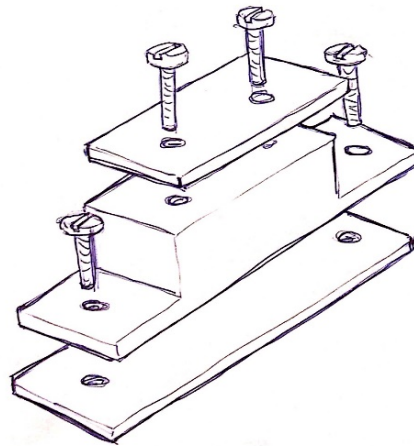
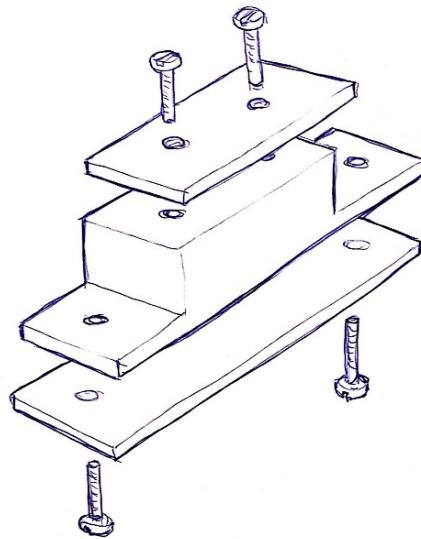


Using gravity
to hold parts
in place



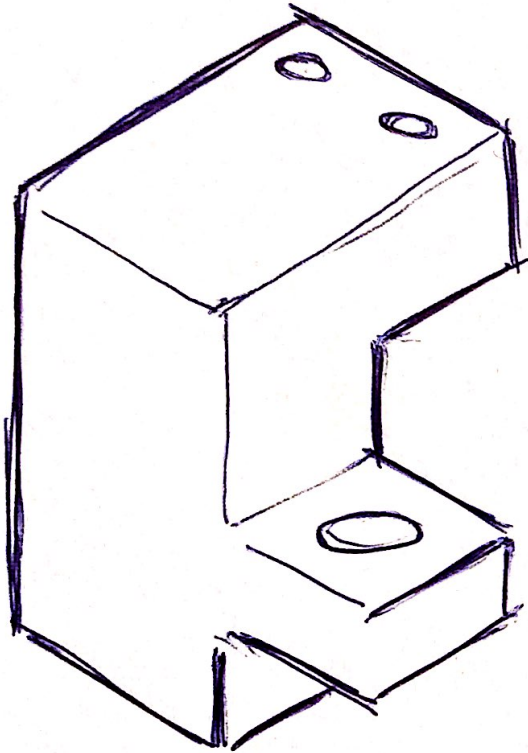
Assemble from a single direction

Parts
assembled
from multiple
directions

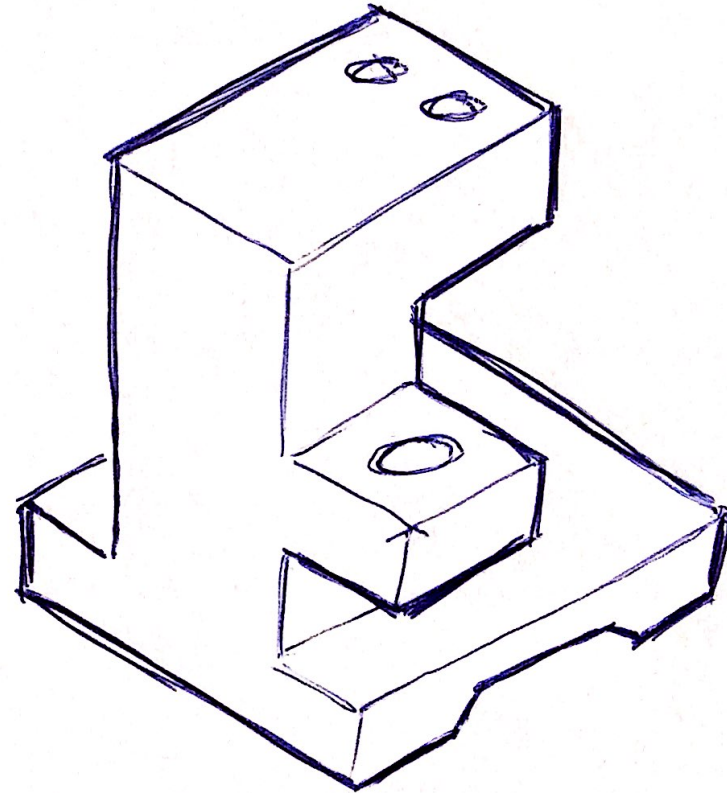


Assembled
from a single
direction

Use a stable base ...



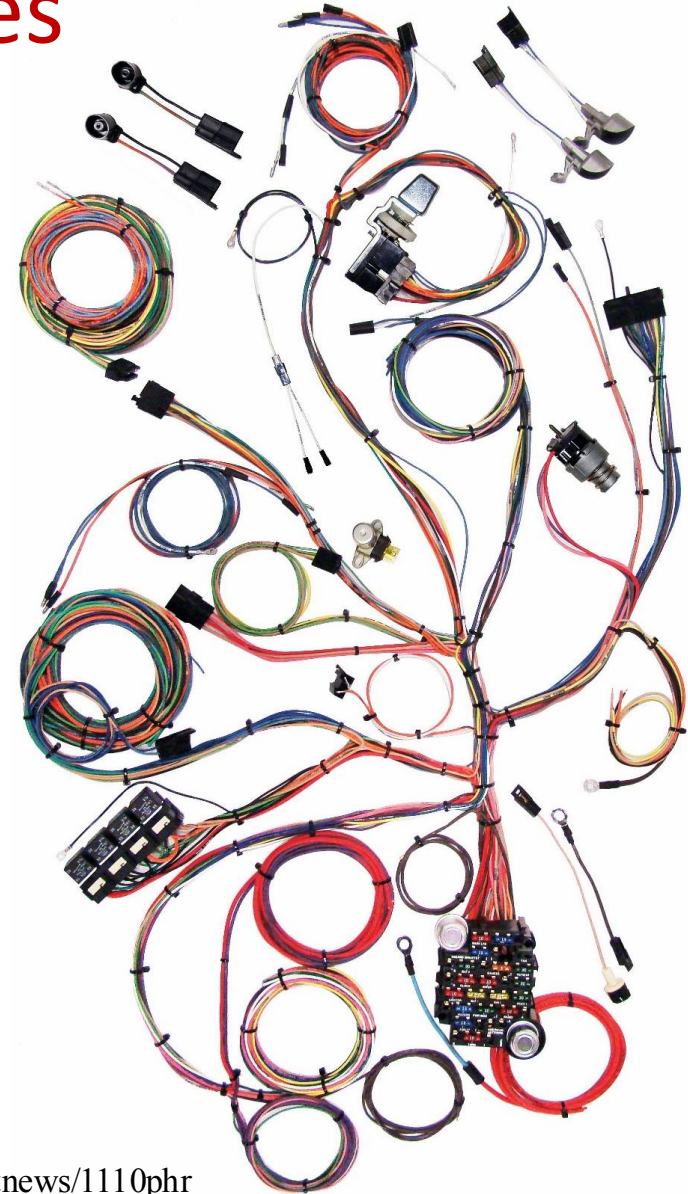
Un-stable base



Stable base

Design out wires and cables

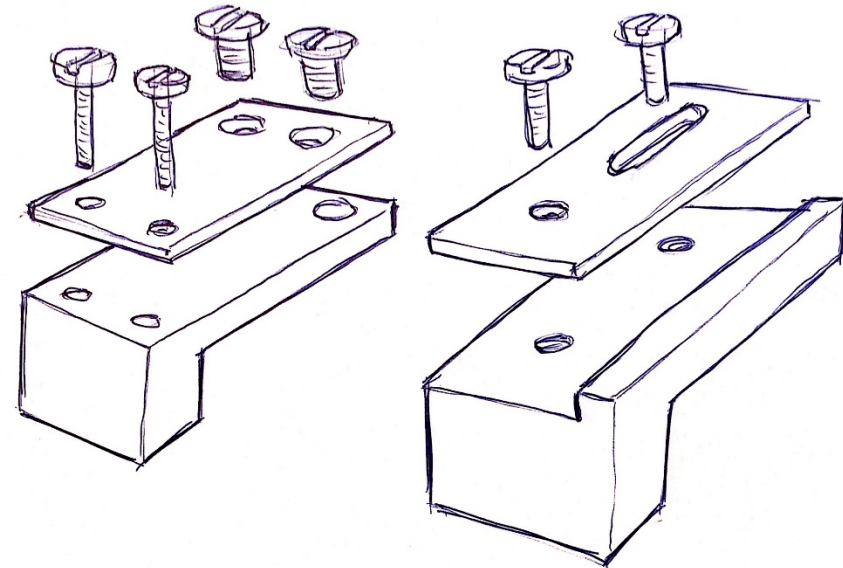
- Wires and cables:
 - are unreliable
 - are expensive
 - present assembly problems
- Alternatives
 - Use Printed Wiring Board (PWB)
 - Use insert molding
 - Use Flex print connection.
 - Plug in direct



http://image.popularhotrodding.com/f/hotnews/1110phr_20_gearhead_answers/34800655/1110phr-03%2B20-gearhead-answers-common-rodding-questions-answered%2Bwiring-harness.jpg

Fixing & joining ...

- Eliminate / minimise fasteners
 - Separate fasteners of same type
 - Different types fasteners
 - Avoid threaded fasteners
- Carefully position fasteners
 - Away from obstructions
 - Provide flat surfaces
 - Provide proper spacing between fasteners
- Simple fastening
 - Self fastening features
 - One handed assembly
 - Parts secured on insertion
 - Single linear motion
- Minimise assembly tools
- Parts should easily indicate orientation direction
 - Self alignment
 - Self orienting / no orientation needed







VS.



31 Parts	38 Stpes
04 Min.*	10 % Eff.*

09 Parts	11 Stpes
01 Min.*	47 % Eff.*



VS.



27
Fewer Steps

Case example: design rules ...

Design for ... installation

- Doorway sizes, roof height and weight distribution
- Must fit lorry (own first), specialist transport, door (height & width), container
- Fork-lifts: max weight, lifting points, access

Design for ... ease of use

- Position, size, shape, force & height of controls

Design for ... safety

- No finger traps & sharp corners
- Directives: CE, ATEX etc



Design for ... training

- Clear manuals & documentation

Design for ... maintenance

- Quick release fasteners
- Visual inspection for critical parts
- Access for maintenance
- Colour code parts by maintenance schedule
- Dust resistant bearings

Design for ... cleaning

- Minimum legs to the floor
- One handed guard removal
- Minimal dirt traps & crevices

Design for Assembly workshops

Objectives:

- Assembly time
- Product rate
- Part count
- Material quantity
- Process Numbers

Understanding of the Heuristic principles

Optimising an assembly - Heuristic principles

- Minimise components
- Use open enclosures
- Don't fight gravity
- Assemble from a single direction
- Use a stable base
- Don't over constrain
- Design out wires and cables

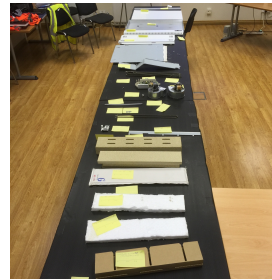


- and we added...
- Avoid the need for holding
 - Test the sub assembly
 - One orientation*

IfM

UNIVERSITY OF CAMBRIDGE

Review and classify current design



Review and timings of assembly process



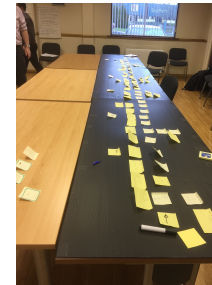
Idea generation – new / improved design



Benchmarking with other designs






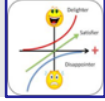








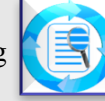








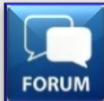


Assembly process “as is” and “to be”



Action plan

Management of Design

Tool set: Experience-based and academically underpinned

Course	Key tools used			
User Centric Product Design	 Persona development	 User observation	 Human factors	 Kano  Product form
Design Management	 Product platforms	 Product planning	 Design outsourcing selection	 Design partnering structures
Product Design to Transform	 Persona development	 User observation	 ECO system Mapping	 Value Mapping  Capability vs. competency
	 Product form	 PSO development	 Kano	 Product road maps
Design for Assembly	 Design for Assembly	 Assembly observation	 Project on a Page	
Design forums	 Design forum			
Other courses in development	 Co-Creation in services		 Sustainable design	

Design check lists interface check list

Example

<i>Issue</i>	<i>Poor performance</i>	<i>Score (1-4)</i>				<i>Great performance</i>
Safety & Hygiene	Difficult-to clean materials (eg sponge); nooks and crannies, hard-to-access areas	1	2	3	4	Appropriate materials (eg stainless steel), see-through portions, smooth joins
	Unsafe & probably illegal	1	2	3	4	Safety & legal issues are critical & well catered for
Getting started	Needs several weeks of training just to get started	1	2	3	4	Training either not needed or well provided for
	Handbook, manual or documentation next to useless	1	2	3	4	Supporting documentation is clear, concise and useful
Maintenance	No schedules for preventative maintenance; recommended spares not thought out	1	2	3	4	Preventative maintenance schedules clear; recommended spare parts highlighted
	Difficult to service, maintain & repair – specialist input is expensive / unavailable	1	2	3	4	Service, maintenance & repair either simple or not – specialist input is readily available
Interface clarity	User interface ignores accepted rules and conventions	1	2	3	4	Interface follows (or improves) accepted rules & conventions – it is compatible with similar devices
	Little layering of information or prioritisation of functions	1	2	3	4	The most important information/functions are the most accessible and are clearly prioritised
	Frequent & unrecoverable errors	1	2	3	4	Little likelihood of errors – but when they happen, recovery is simple
	Little or no feedback between action and effect	1	2	3	4	Clear & obvious feedback lets you know when action performed
	Little or no natural mapping between controls and resulting actions	1	2	3	4	Clear & obvious natural mapping between controls & resulting actions
	Few designed in constraints to prevent errors or guide actions	1	2	3	4	Appropriate constraints designed in to prevent errors or guide actions
	Interface is unlikely to be understood by much of the target populations	1	2	3	4	Interface will be understood by both the target and the wider population
	Changeovers difficult (many bolt sizes, multi-axis setups, slots, etc)	1	2	3	4	Equipment can be easily changed from one product to another, using end-stops, quick release clamps, etc
Physical usability	Physical elements have the wrong size, shape and arrangement to be used comfortably	1	2	3	4	All elements have the right size, shape and arrangement for users in the target population
	Size, shape or position of elements cannot be adjusted to suit the needs of different users	1	2	3	4	All necessary adjustments well catered for
<i>Overall poor usability</i>		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Overall excellent usability</i>

Design outsourcing

Example

Identify the candidates

Identifying candidates ...

- Word of mouth – staff, colleagues, peers – who have people used before
- Local providers
- Recommendation
 - Try asking a (non competitive) company with a strong product who did the design for them
 - Proactively look for products which you admire
- National bodies: The Design Council, Design Business Association, British Design Innovation
- Award winners
- Web (www.designdirectory.co.uk/)



Section Criteria

Establishing selection criteria ...

Issue	Requirement	#1	#2	#3	Comments
Location - distance	<1 hour travel				
Completed jobs	Other work in the similar industry Examples of similar manufacturing volume Award winners				
Quality	Examples of previous work References to contact				
Specific skills	User observation and interview skills				
Track record	Year established / number of employees				
Cost	Fixed and per phase Cost of criteria				
Prototyping capability	Able to produce rough concept models				
Working methods	ID accredited - structured process Professional accreditation Professional indemnity insurance				
IT compatibility	ID CAD capability Data transfer				
Engineering skills	Capable of producing detailed drawings Strong manufacturing process knowledge				
Confidence	Ability to deliver on time, cost & quality				
Workload	Other commitments Clear place in the queue				
Personality / rapport	Relationship between our engineer and the allocated designer				

Process for selection

A suggested process

- Identify around ten to sell their approach to a senior team
- Team selects 5 to 'pitch'
- **Paid** pitches, very early concept ideas
 - To test their approach, how they work, the 'fit'
 - To determine their capabilities
- Select a preferred partner

Develop Briefing

Briefing (1) ...

Outline contents of a design brief - Moultrie (2003)

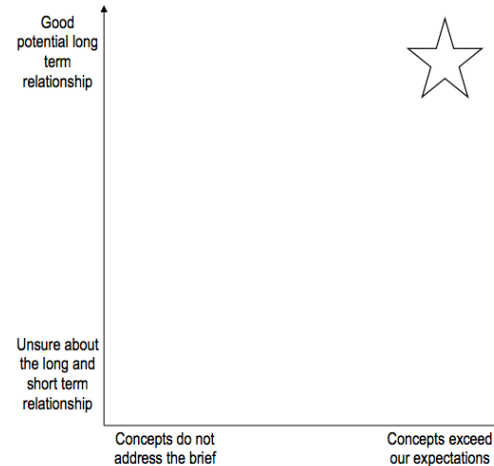
- A. The opportunity**
 - f The problem
- B. The proposed product**
 - f The product vision

Briefing (2) ...

Outline contents of a design brief - Moultrie (2003)

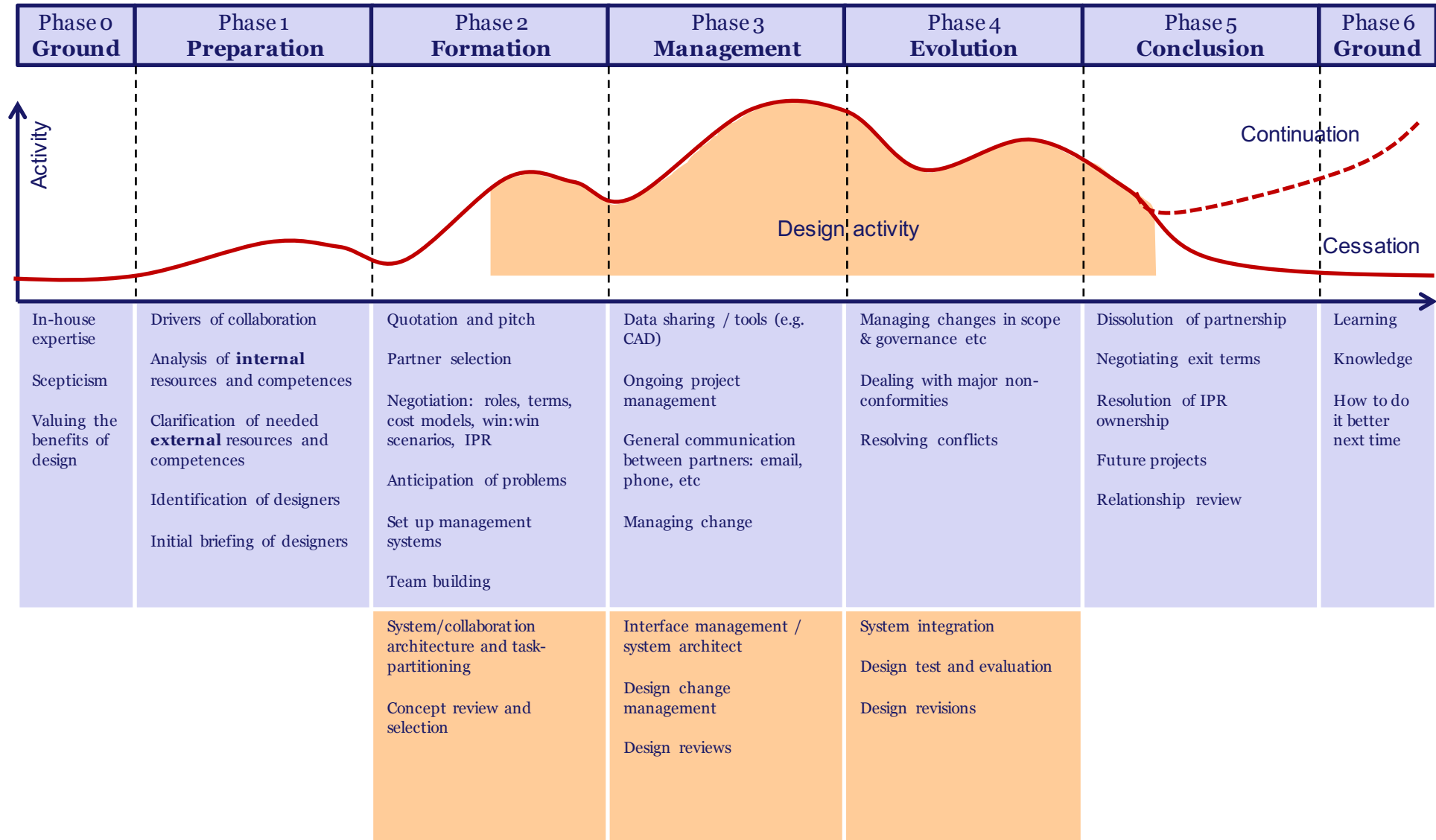
- C. The project**
 - f Objectives
 - f Project goals
 - f Business goals (quantitative)
 - f Business goals (qualitative)
 - f Final production volumes
 - f Budget
 - f Risks
 - f Specific requirements
 - f CAD compatibility
 - f Project management and responsibilities
 - f Success criteria
- D. The company**
 - f Background information
 - f Business strategy
- E. The industrial design requirement**
 - f Scope
 - f Skills
 - f Terms of business

Mapping the agencies ...



Outsourcing life-cycle

Example



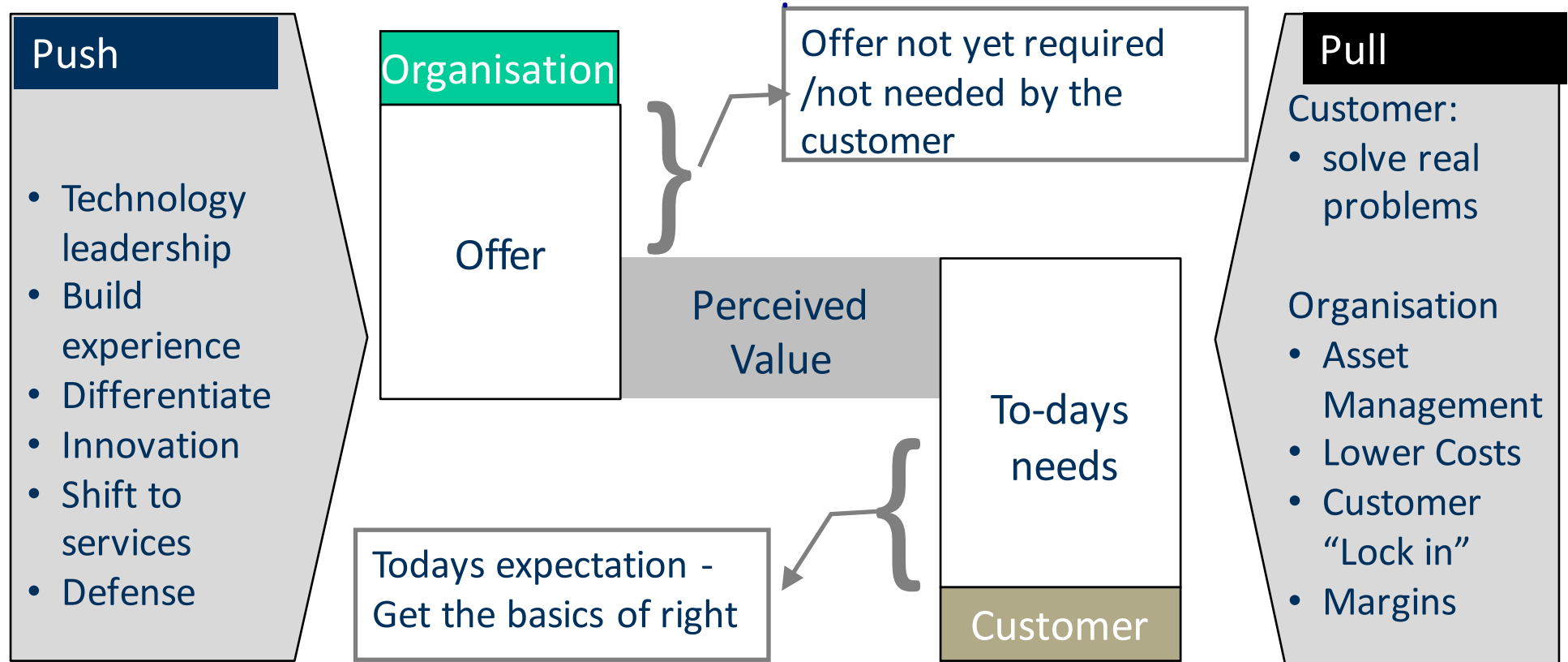
Collaboration maturity

Example

	Level 1	Level 2	Level 3	Level 4
Collaboration Strategy <i>“Conscious choice between internal or external sources of design and development expertise”</i>	(Not) Invented Here!	Occasional ad-hoc partnering	Established partners	Regular review of competences
Structured development process <i>“A clear and well documented process to deliver new products to market”</i>	No formal NPI process	A process exists but ...	Process used and understood	Continuous NPI improvement
System design & Task Partitioning <i>“Design to enable separate development and facilitate integration of modules”</i>	Interfaces not well defined	Intuitively consider modularity	Formal configuration planning	Conscious Simultaneous Design
Partner Selection <i>“Ensuring that partners have adequate capabilities and resources”</i>	Cross fingers and hold breath	Word of mouth	Review of technical capability	Broad assessment of capabilities
Getting Started <i>“Resources committed, with a clear definition of roles and responsibilities”</i>	But we’ve already started!	Is this a good deal?	Agreement in place	All ground rules agreed and communicated
Partnership management <i>“Well defined and effective communication paths, with regular and open reviews of progress”</i>	‘I thought you were doing that’	Managed but not championed	Collaboration champions	Frequent and open communication
Partnership development <i>“Building a climate of trust and confidence, with the development of a dependable relationship”</i>	‘I’ll be glad when this project’s over’	Better the devil you know ...	Good working relationship	On-going, mutually beneficial

In summary

Does your organisation align with customers?



Working with us

Design management group contacts

Research,
Development and
Education



James Moultrie



Colin Haden

ECS Consultancy

Questions?