



Evaluating User Interface Visibility



- What's the problem
- Understanding Vision
- Evaluating User Interface Visibility
- Introduction to the tool

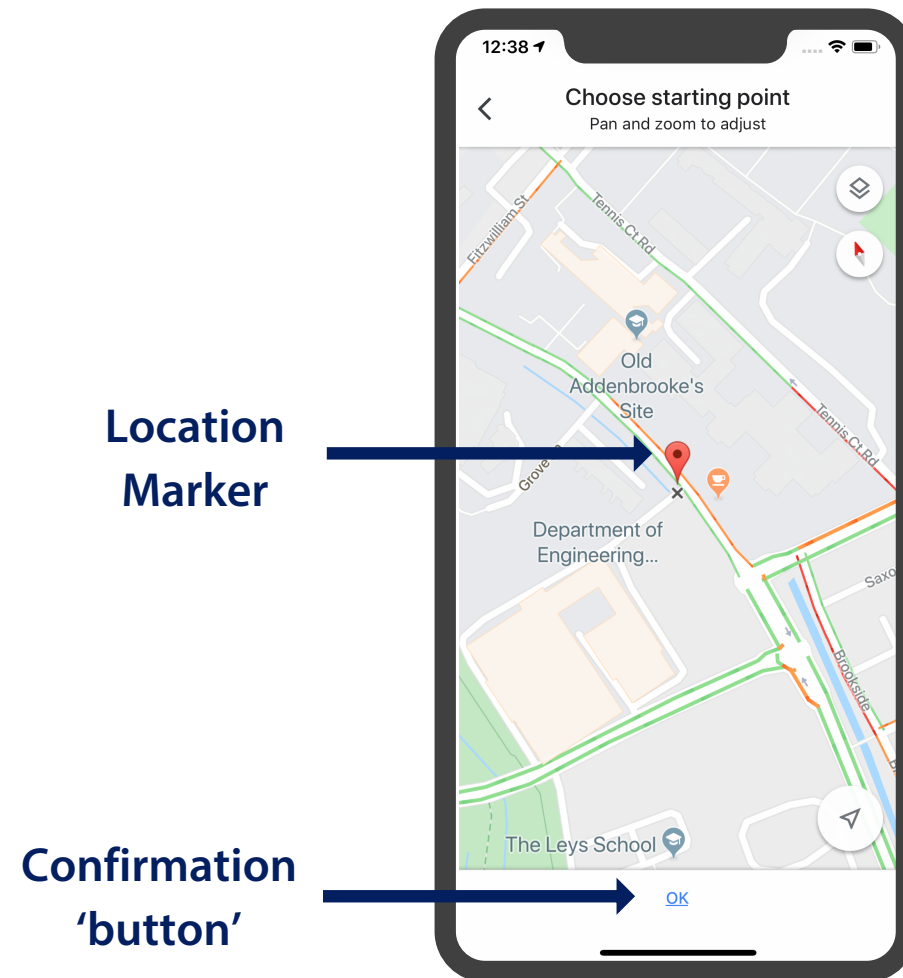
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What's the Problem



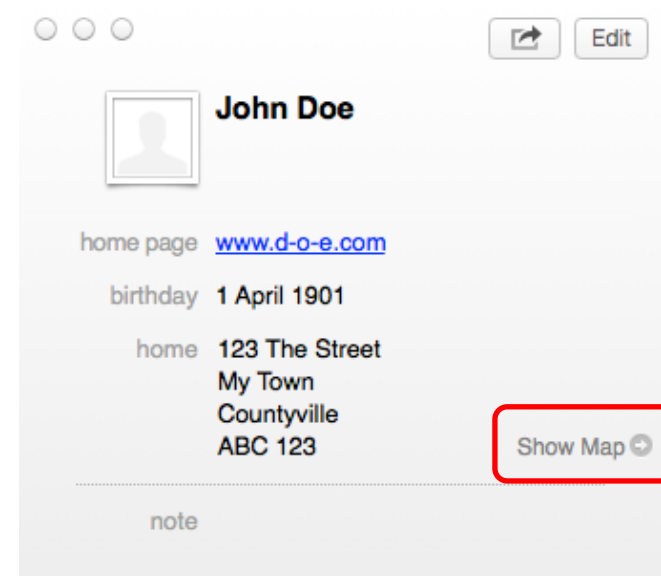
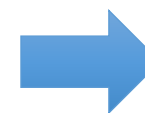
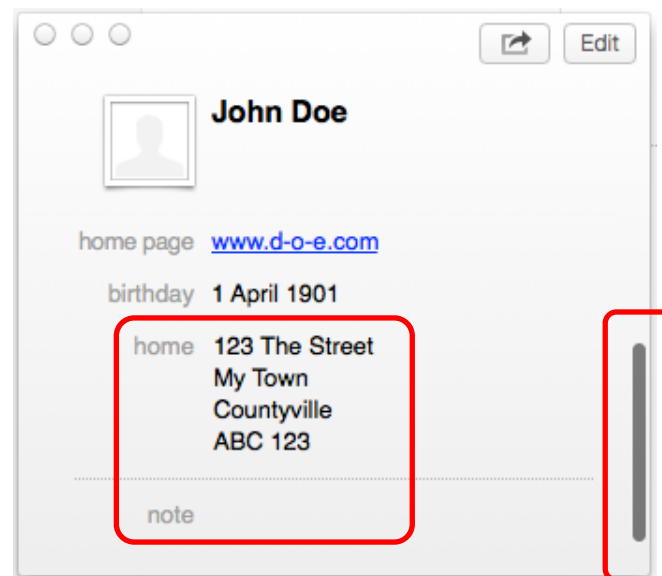
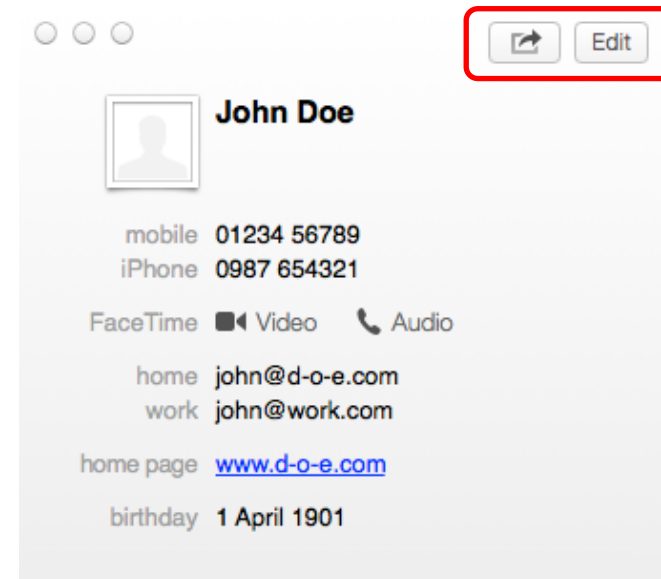
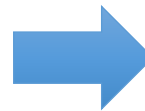
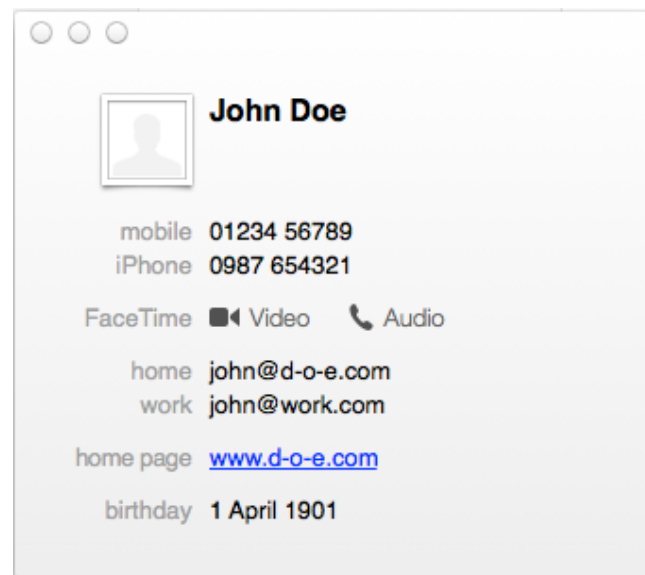
1 Billion iOS devices: how visible is the UI?



Function	Initial Action	Visible
Sleep	Press power key	
Power off	Press & hold power key	X
Reset	Press and hold power and home key	X
Volume up	Press volume up	
Volume down	Press volume down	
Mute	Press & hold volume down	X
Ringer silent	Slide switch	
App launch	Press	
Open folder	Press	
Create folder	Press & drag app onto app	X
Delete folder	Remove all apps	X
Browse apps	Swipe left & right	X
Delete App	Press & hold	X
Move App	Press & hold	X
Switch active app	Press x2	X
Stop active app	Press x2	X
Search	Press x2 or swipe	X
Return home	Press home key	X
Accessibility	Press x3 (if activated)	X
Keypad lock	Press power key	X

Orientation lock	Press x2 then swipe right	X
Volume (soft)	Press x2 then swipe right x2	X
iPod control	Press x2 then swipe right	X
Siri	Press & hold home	X
Notifications Centre	Swipe down from top bezel	X
Control Centre	Swipe up from bottom bezel	X
Screen capture	Power + Home	X
Zoom	Double tap with 3 fingers	X
Adjust magnification	Double tap with 3 fingers and drag up or down	X
Pan	Drag 3 fingers or hold finger near edge	X
Pan speed	Finger closer to edge	X
Full or window zoom	Triple tap with 3 fingers and then tap window zoom	X
Resize zoom	Triple tap with 3 fingers then tap resize lens	X
Greyscale invert	Triple tap & choose filter	X
Basic Search	Drag down	X
Enhanced Search	Drag right from home	X
Screen rotation	Turn phone	X
Reachability	Lightly tap home (turned on in accessiblility)	X
Create new home screen	Drag app to right of last home screen	X
Power saving	Put face down	X
Force touch...		X

Apple OSX Address Book



"The important design rule of a GUI is visibility" ¹



"**Visibility** indicates the mapping between intended actions and actual operations. **Visibility** indicates crucial distinctions—so that you can tell salt and pepper shakers apart, for example. And **visibility** of the effects of the operations tells you if the lights have turned on properly, if the projection screen has lowered to the correct height, or if the refrigerator temperature is adjusted correctly. It is lack of **visibility** that makes so many computer-controlled devices so difficult to operate. And it is an excess of **visibility** that makes the gadget-ridden, feature-laden modern audio set or video cassette recorder (VCR) so intimidating." ²

1. Norman, D.A., 2010. Natural user interfaces are not natural. interactions, 17(3), pp.6–10.

2. Norman, D.A., The design of everyday things, New York : Doubleday.

How do we understand differing approaches?

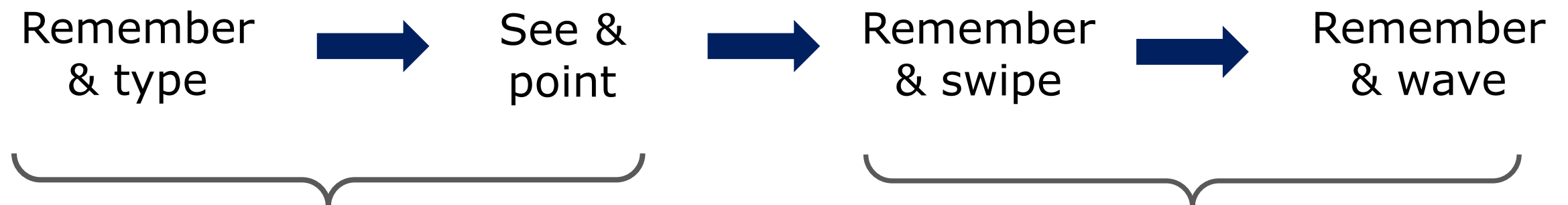


Sony Google TV remote



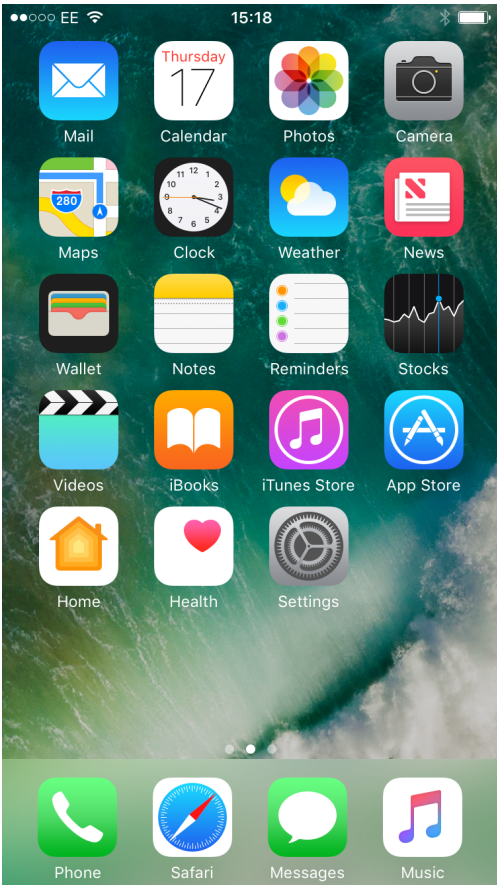
Apple TV remote

A very brief history of user interfaces



Smith, D.C. et al., 1982.
Designing the Star User
Interface. *Byte*, (4),
pp.242–282.

How does it add?



Function	Initial Action	Visible
Sleep	Press power key	✓
Power off	Press & hold power key	✗
Reset	Press and hold power and home key	✗
Volume up	Press volume up	✓
Volume down	Press volume down	✓
Mute	Press & hold volume down	✗
Ringer silent	Slide switch	✓
App launch	Press	✓
Open folder	Press	✓
Create folder	Press & drag app onto app	✗
Delete folder	Remove all apps	✗
Browse apps	Swipe left & right	✗
Delete App	Press & hold	✗
Move App	Press & hold	✗
Switch active app	Press x2	✗
Stop active app	Press x2	✗
Search	Press x2 or swipe	✗
Return home	Press home key	✗
Accessibility	Press x3 (if activated)	✗
Keypad lock	Press power key	✗

Orientation lock	Press x2 then swipe right	✗
Volume (soft)	Press x2 then swipe right x2	✗
iPod control	Press x2 then swipe right	✗
Siri	Press & hold home	✗
Notifications Centre	Swipe down from top bezel	✗
Control Centre	Swipe up from bottom bezel	✗
Screen capture	Power + Home	✗
Zoom	Double tap with 3 fingers	✗
Adjust magnification	Double tap with 3 fingers and drag up or down	✗
Pan	Drag 3 fingers or hold finger near edge	✗
Pan speed	Finger closer to edge	✗
Full or window zoom	Triple tap with 3 fingers and then tap window zoom	✗
Resize zoom	Triple tap with 3 fingers then tap resize lens	✗
Greyscale invert	Triple tap & choose filter	✗
Basic Search	Drag down	✗
Enhanced Search	Drag right from home	✗
Screen rotation	Turn phone	✗
Reachability	Lightly tap home (turned on in <u>accessiblity</u>)	✗
Create new home screen	Drag app to right of last home screen	✗
Power saving	Put face down	✗
Force touch...		✗

10% Visible?

Understanding Vision

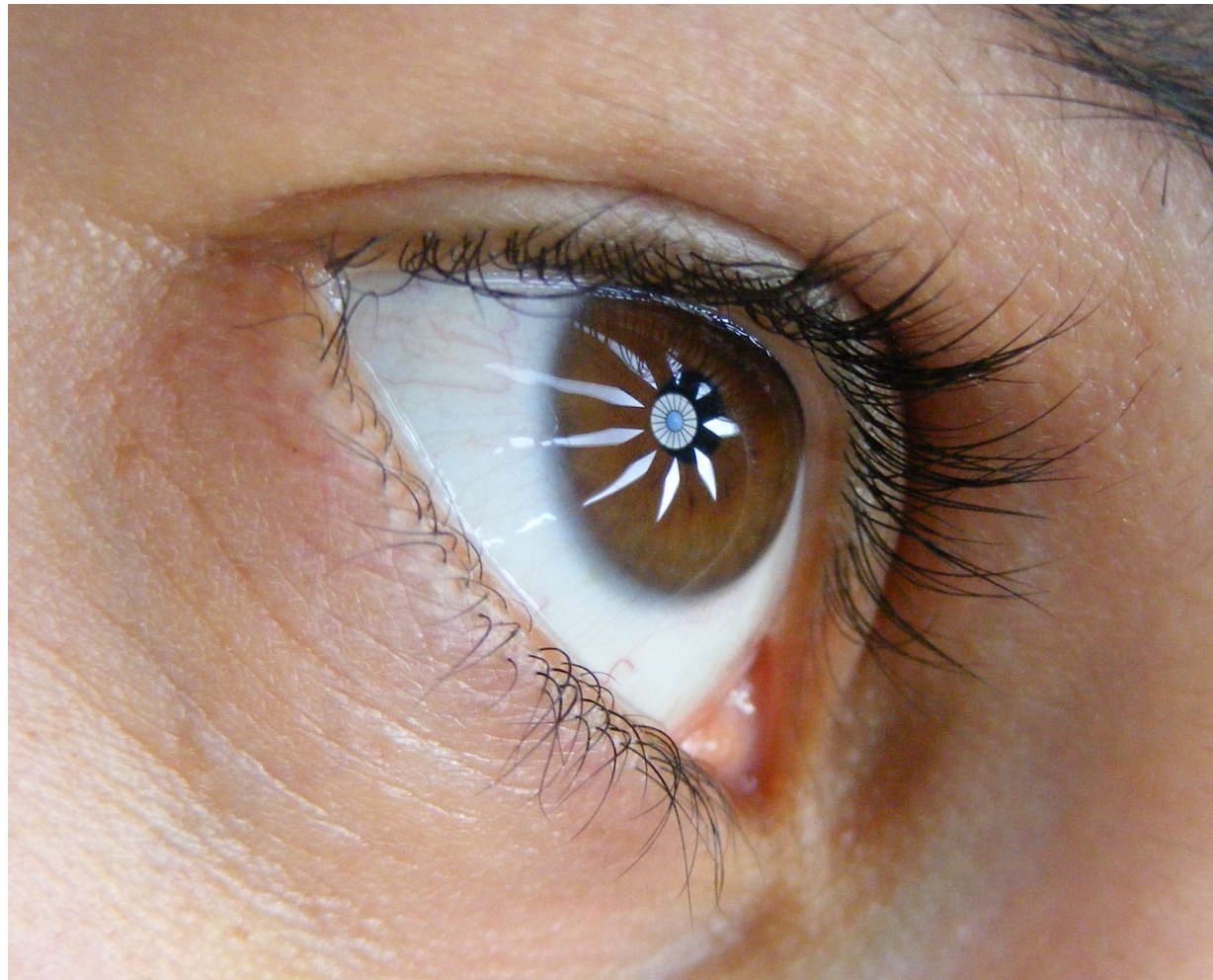




Watch the video entitled “The Monkey Business Illusion”
from the following YouTube link:

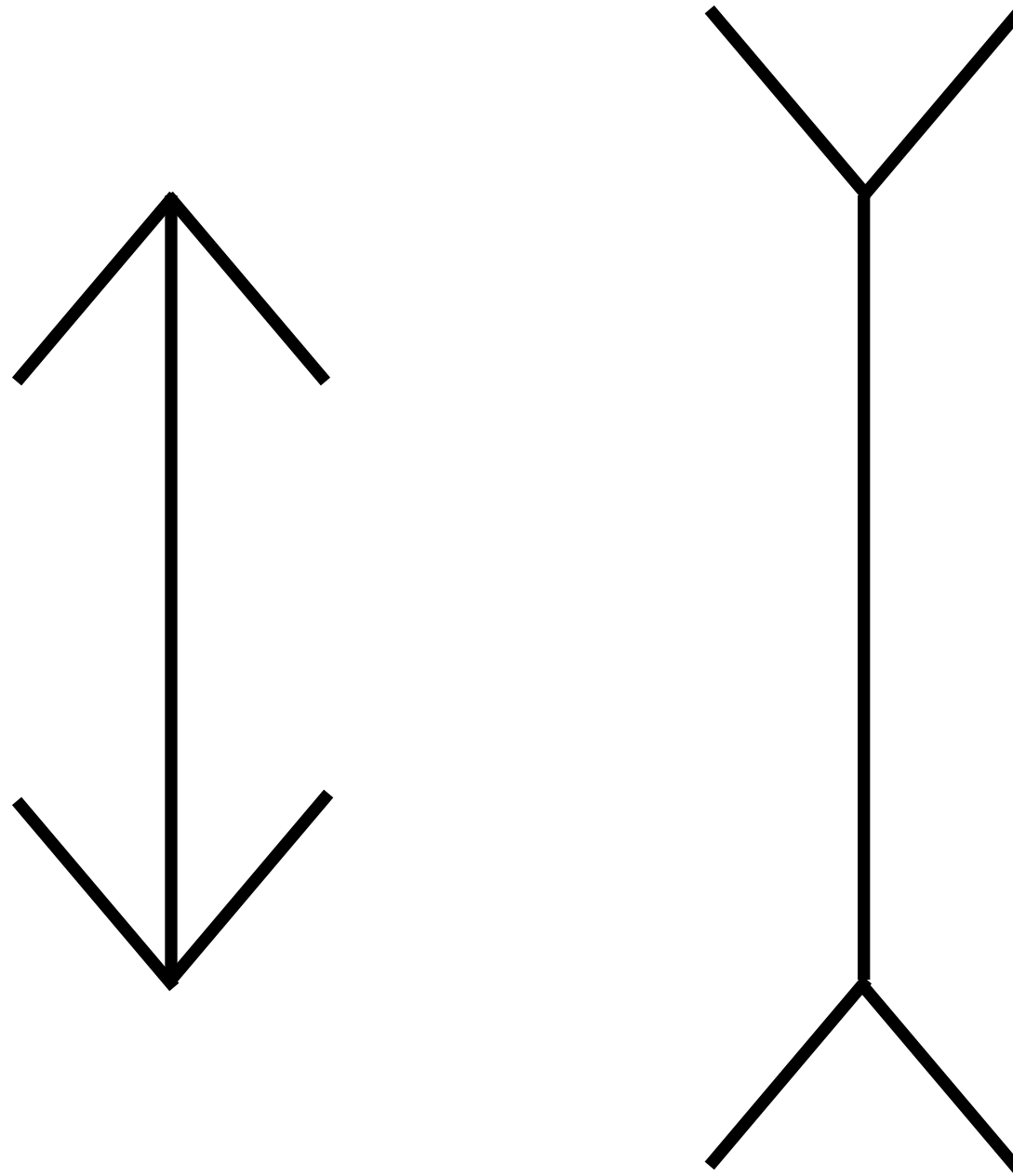
https://YouTube/IGQmdoK_ZfY

What is in the eye of the beholder?

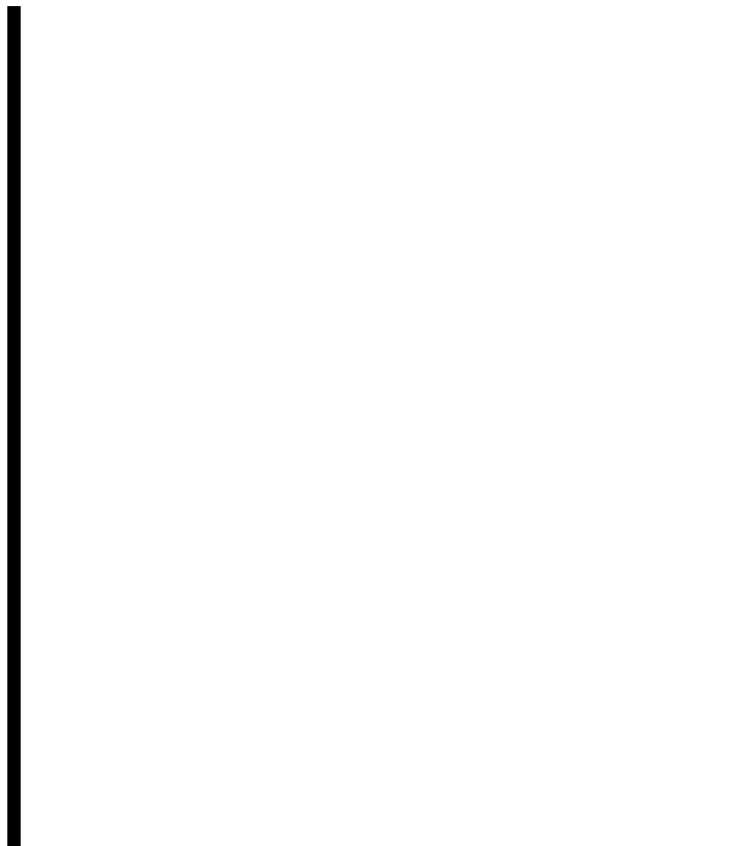


See is believing?

Müller-Lyer 1889

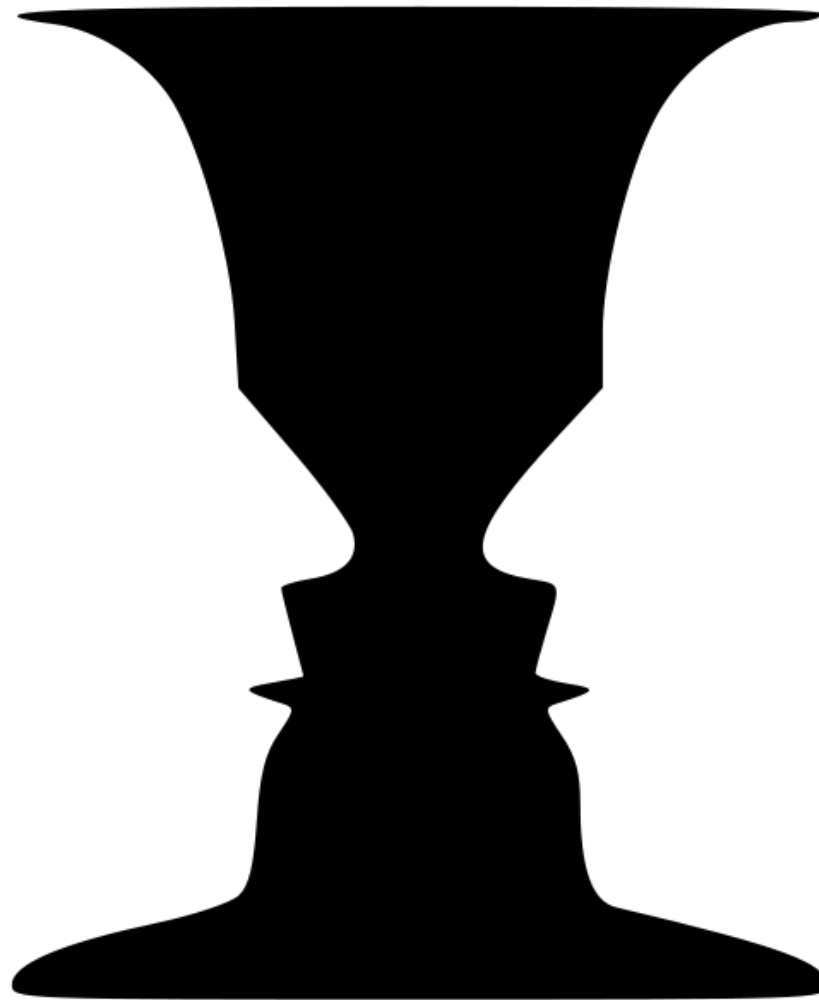


Müller-Lyer 1889

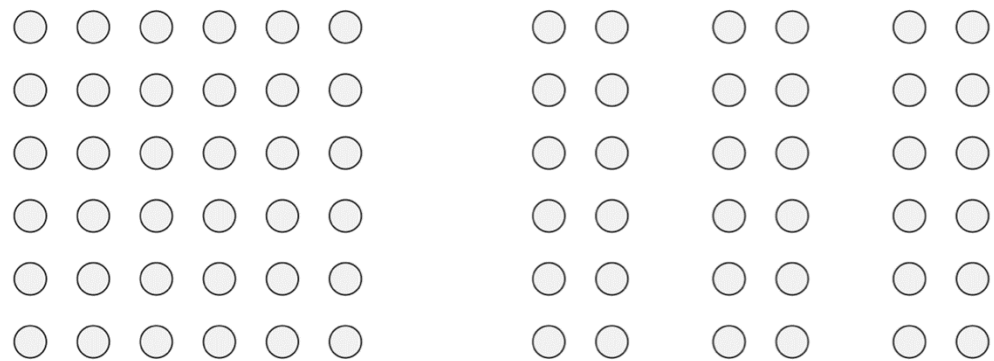


Müller-Lyer, FC (1889), "Optische Urteilstäuschungen"; Archiv für Physiologie Suppl. 263–270.

Multistability: Rubin 1915

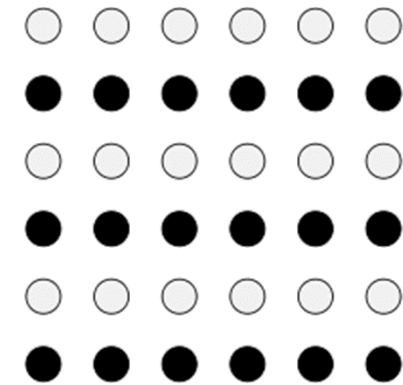


Laws of Grouping: Wertheimer 1923



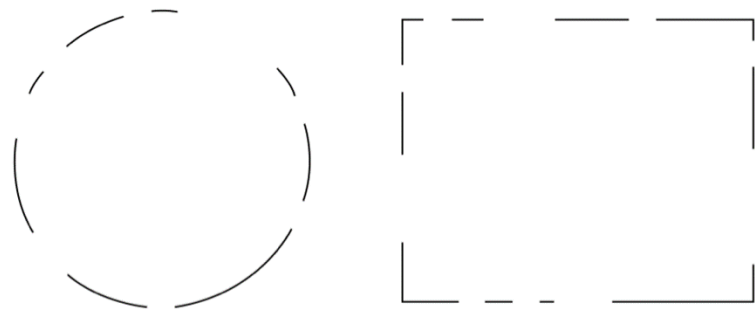
Proximity

ineligible for copyright



Similarity

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Closure

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Symmetry

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Multistability: The 'Boring Figure' 1930 (original 1888) 🔍



Public Domain: *My Wife and My Mother-in-Law*, by the cartoonist W. E. Hill, 1915 (adapted from a picture going back at least to a 1888 German postcard)

Boring, E. G., 1930. "A New Ambiguous Figure," *American Journal of Psychology*, 42, 444.

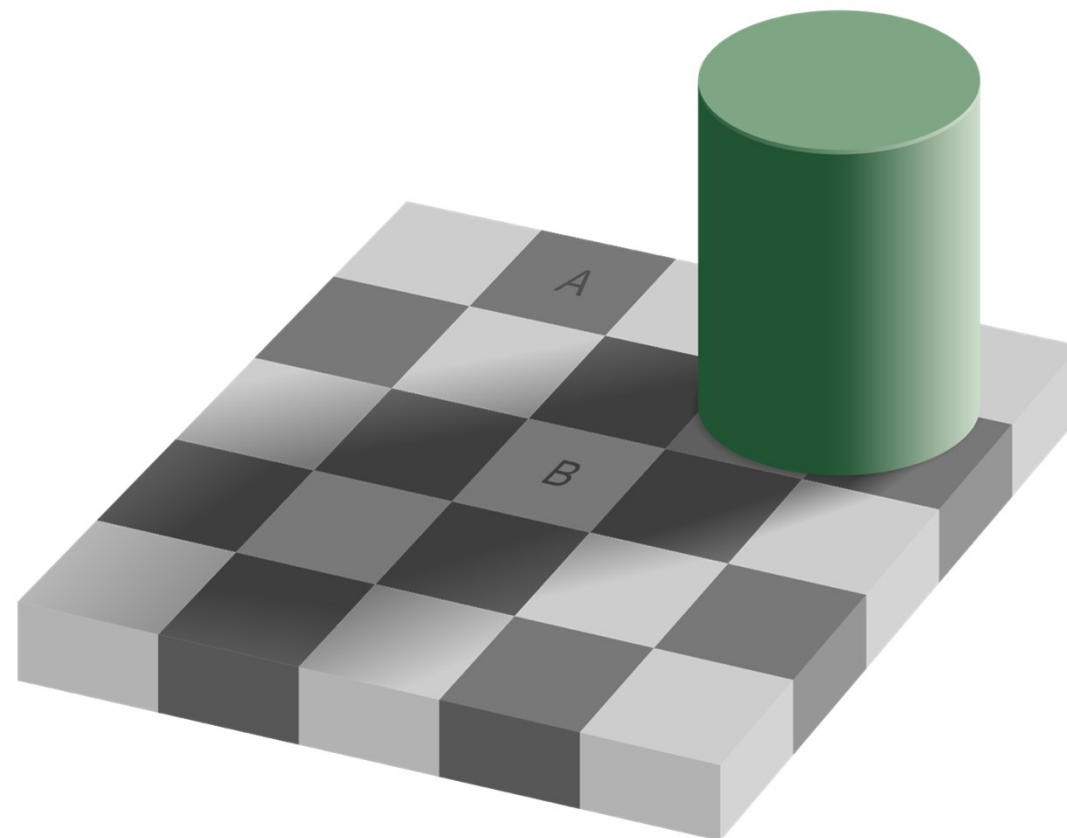
N.B. This figure was not created by Boring himself

Penrose Triangle 1958 (based on Reutersvård 1934)



© Arkopri / Wikimedia Commons / [CC-BY-SA-4.0](#)

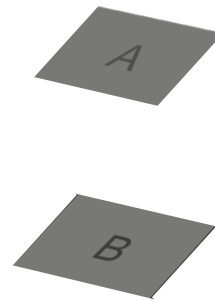
Penrose, L.S.; Penrose, R. (1958). "Impossible objects: A special type of visual illusion". *British Journal of Psychology* 49: 31–33.
doi:10.1111/j.2044-8295.1958.tb00634.x. PMID 13536303.



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Checker shadow illusion - Adelson 1995

Colour Constancy: Land 1964



Checker shadow illusion - Adelson 1995

Emergence: R.C. James 1965



R.C. James' emergent image of a dalmatian dog was used for instructional purposes and has been removed to allow this document to be published online.

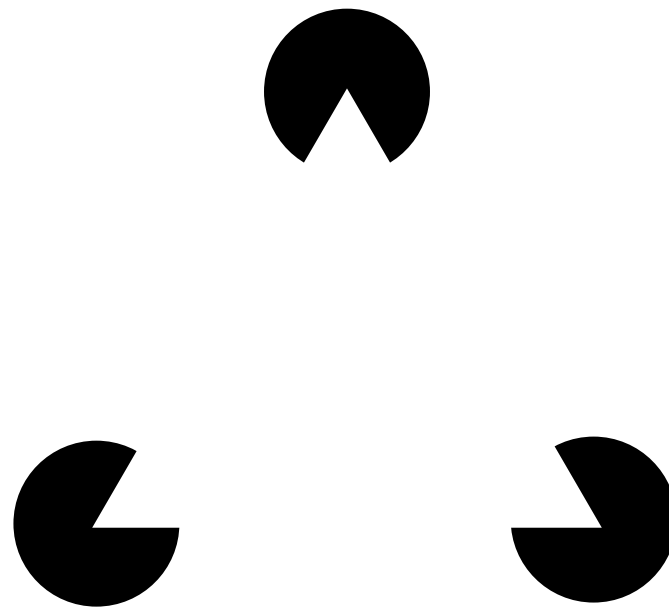
Suitable images can be found at the following link. These potentially can be used for instructional purposes, but due consideration of the copyright needs to be made for any use.

http://graphics.stanford.edu/~niloy/research/emergence/emergence_image_siga_09.html

The images at this link are based on the work of:

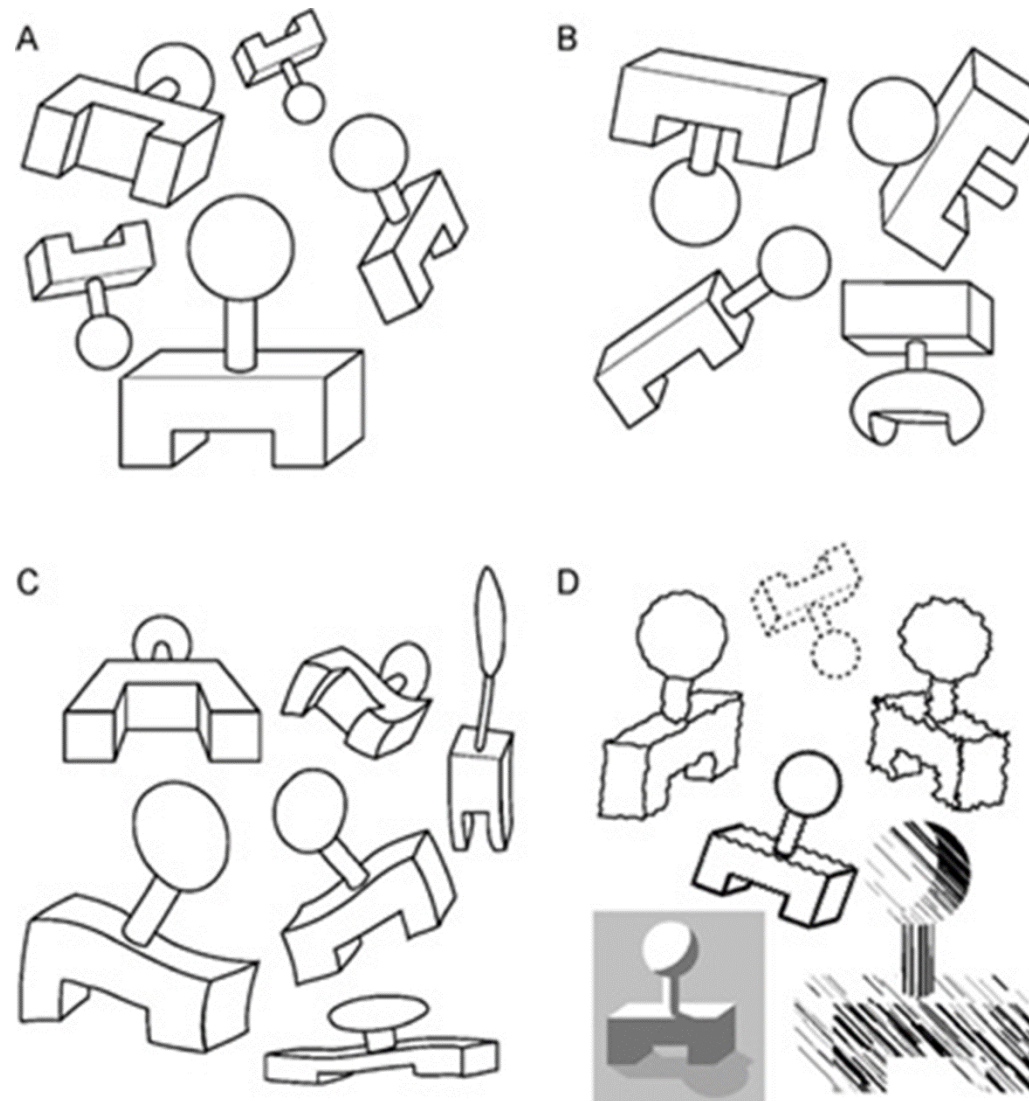
Mitra et al (2009) Emerging images. ACM SIGGRAPH ASIA 2009

Reification: Kanizsa 1979





Invariance: Lehar 2003





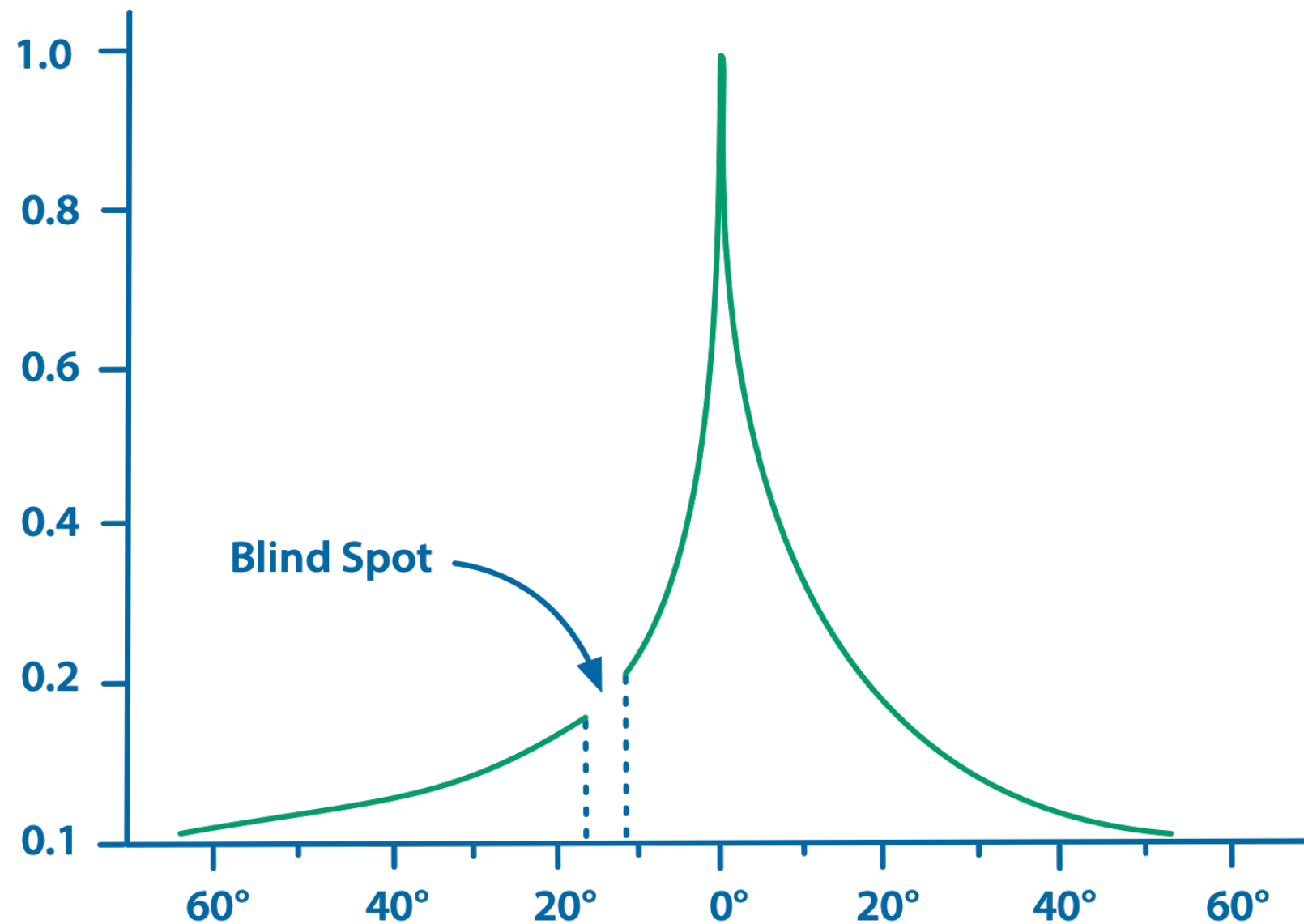


"Nice Beever" by benhollingsworth is licensed under [CC BY-NC-SA 2.0](https://creativecommons.org/licenses/by-nc-sa/2.0/)



BEEDIVING
IS SEEING

Foveated Image

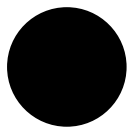


Variation in visual acuity across visual field. Redrawn by Ian Michael Hosking from (copyright) Vanessa Ezekowitz [\[CC BY-SA 3.0\]](https://creativecommons.org/licenses/by-sa/3.0/) and described as Coren's acuity graph by Blanke and Bajaj (2002)

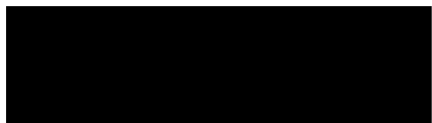
Filling in the the blanks



Close your right eye and stare at the numbers starting at 1 until the circle disappears or the line is filled in



1 2 3 4 5 6 7 8 9



1 2 3 4 5 6 7 8 9

The perceptual theatre of the mind



“The mind is a kind of theatre, where several perceptions successively make their appearance; pass, repass, glide away and mingle in an infinite variety of postures and situations.”

David Hume (1739) A Treatise of Human Nature Book I, Part 4, Section 6

© Stinglehammer / Wikimedia Commons / David Hume statue on High Street, Edinburgh 03 [CC-BY-SA-4.0](https://creativecommons.org/licenses/by-sa/4.0/)

So what is the illusion?



The illusion is that vision is an exact
projection of the world

BUT

The mind fills in blanks and filters
information to enable us to effectively
engage with the world

Missing, missed & misunderstood



Missing

User Interface controls are invisible

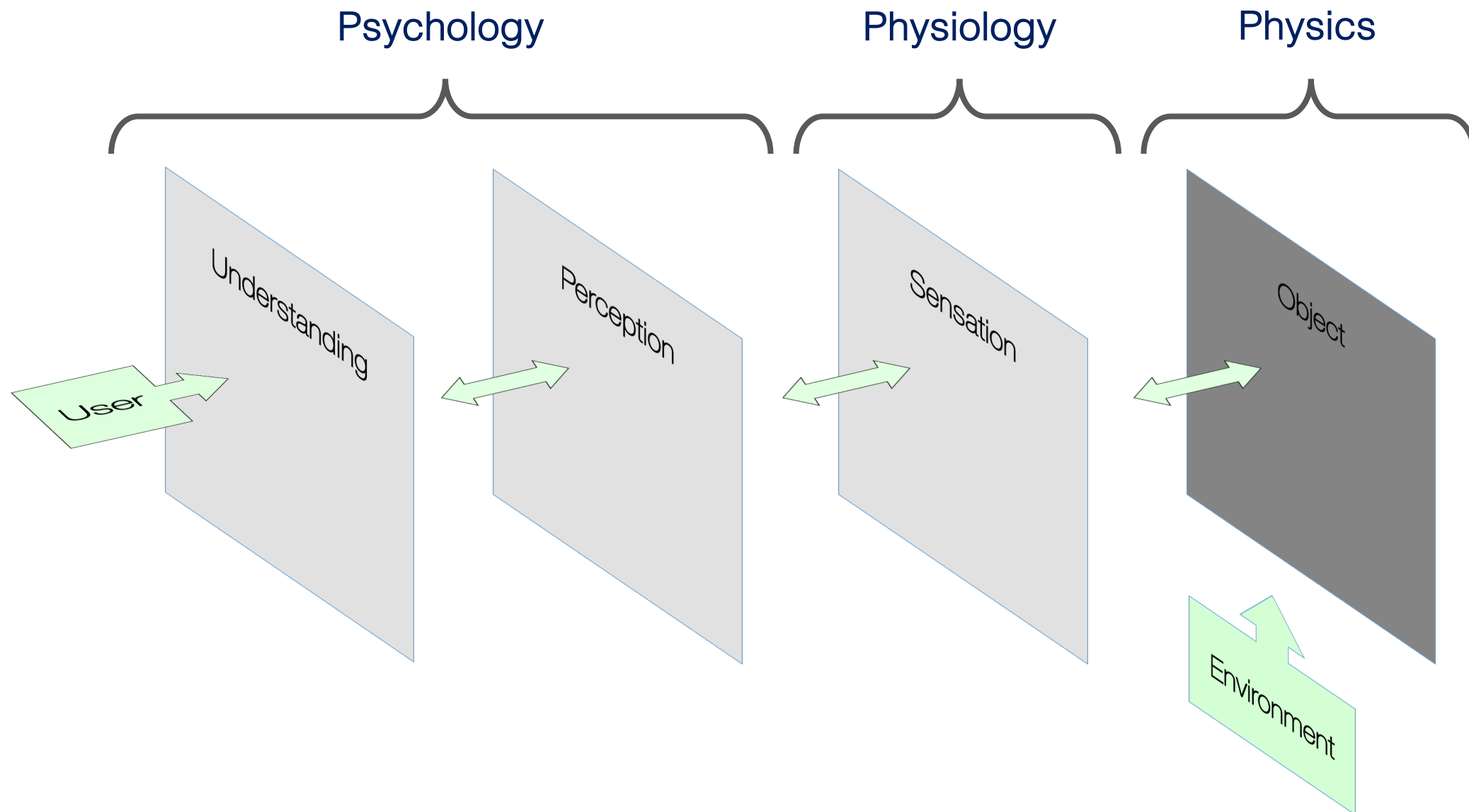
Missed

Attentional or size/contrast issues leads to a lack of perception

Misunderstood

The concept represented visually is not understood

Shedding light on visibility



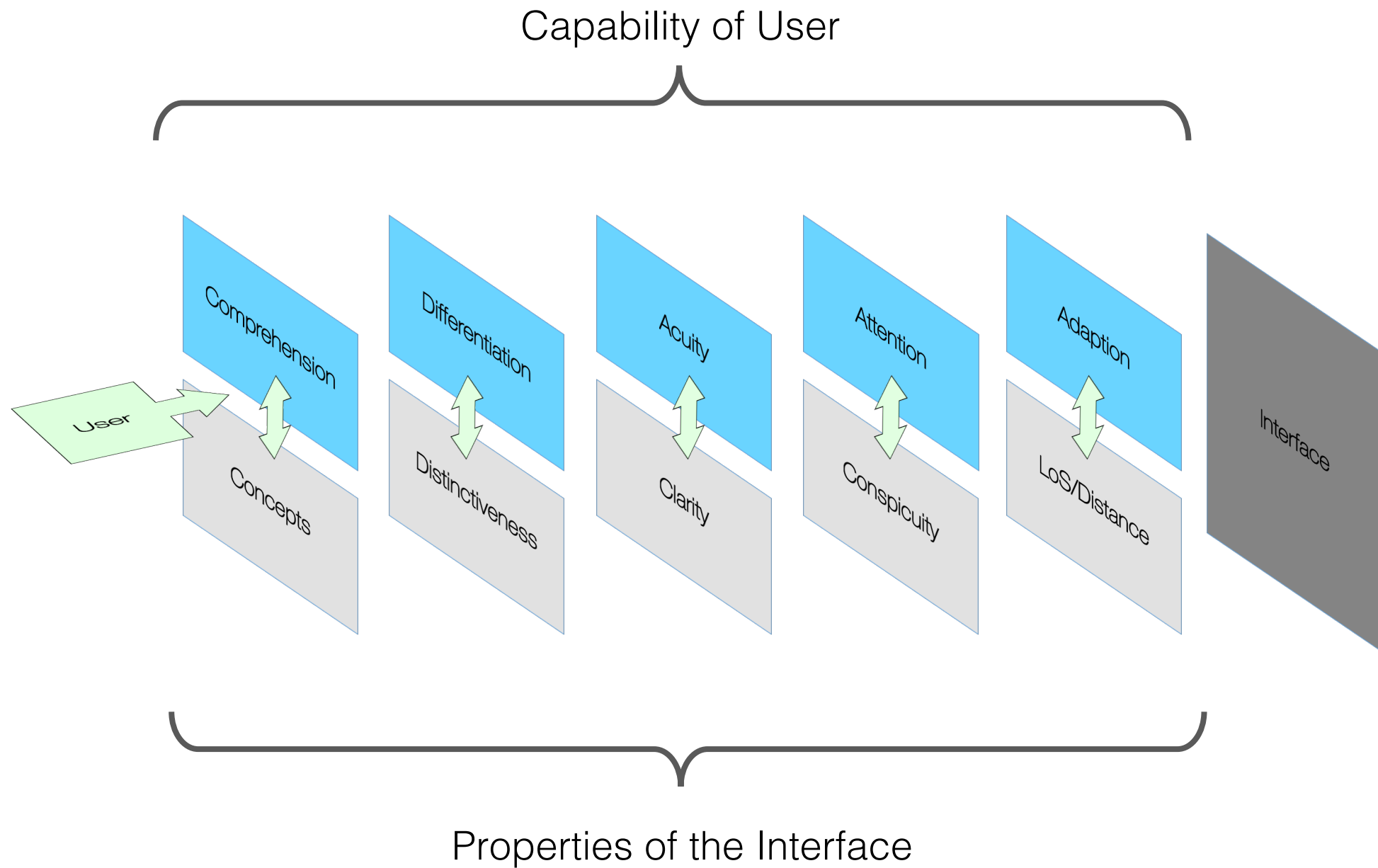
Control Based View: Function, Operation, Feedback



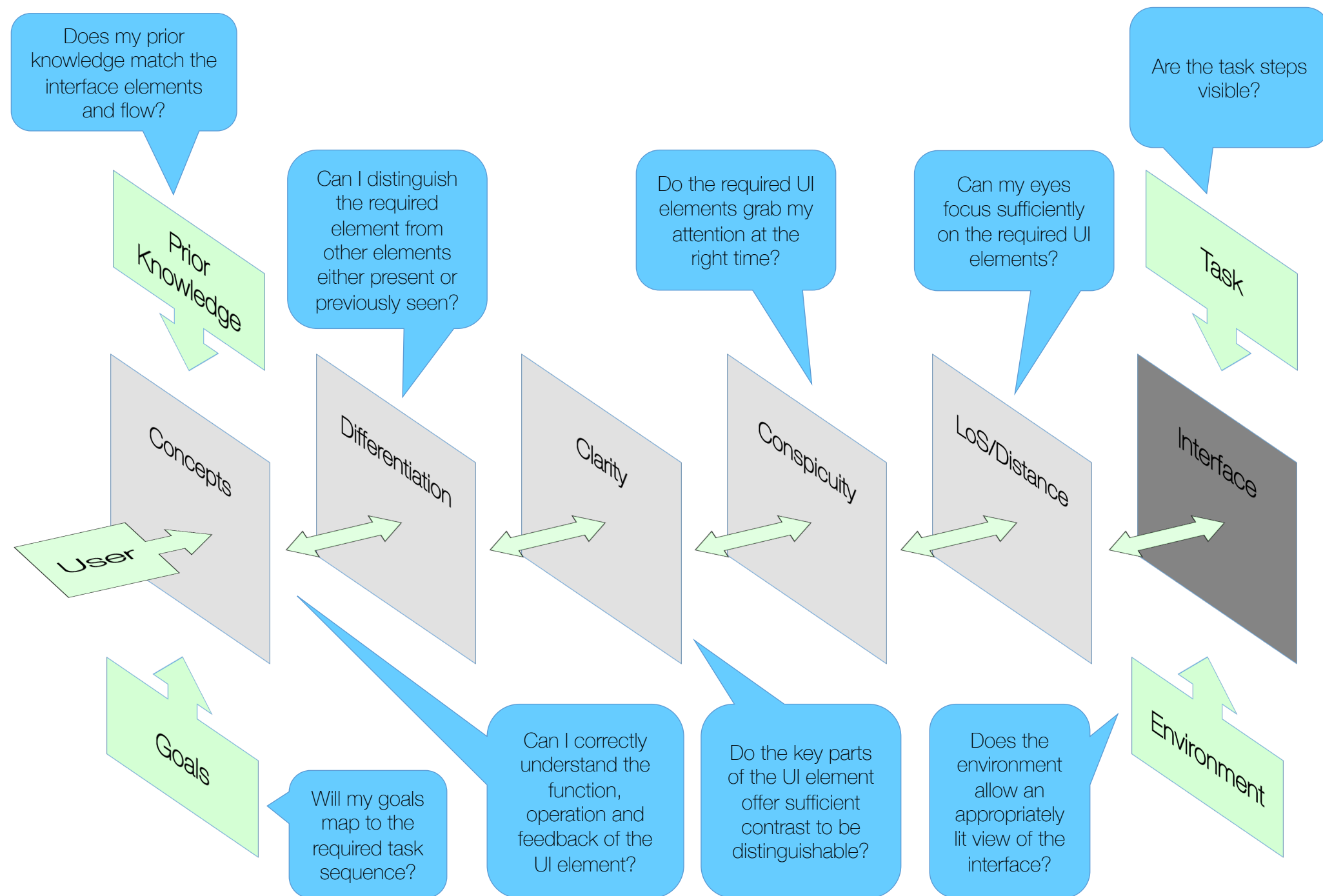


1. Can I **focus** on it?
2. Does it grab my **attention**?
3. Is it **clear**? (contrast, colour & shape)
4. Is it **distinctive** from other things?
5. Can I **comprehend** what it's for?

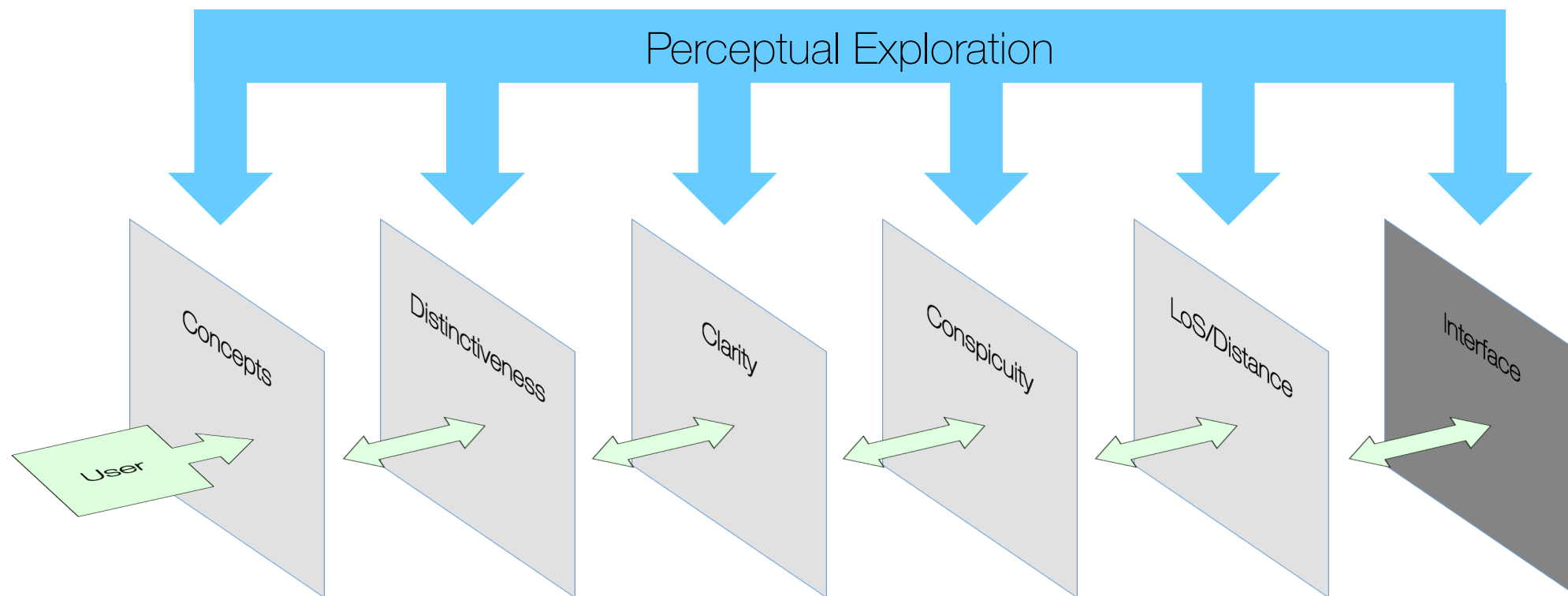
The Tool Framework



Asking the right questions



Network versus sequence



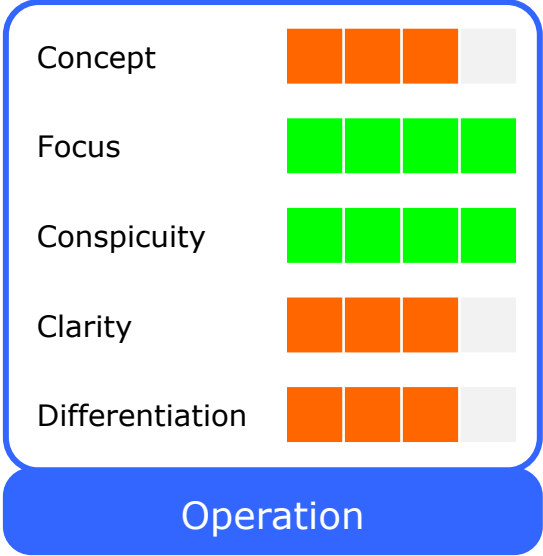
Visibility layers in action



Comprehension Concepts	Differentiation Distinctiveness	Clarity Acuity	Conspicuity Attention	Adaption LoS/Distance	Interface
					



Control based analysis



The Tool in Action



1. Turn on



1. Turn on

Function

Concept	<div><div></div><div></div><div></div><div></div></div>
Focus	<div><div></div><div></div><div></div><div></div></div>
Conspicuity	<div><div></div><div></div><div></div><div></div></div>
Clarity	<div><div></div><div></div><div></div><div></div></div>
Differentiation	<div><div></div><div></div><div></div><div></div></div>

Operation

Concept	<div><div></div><div></div><div></div><div></div></div>
Focus	<div><div></div><div></div><div></div><div></div></div>
Conspicuity	<div><div></div><div></div><div></div><div></div></div>
Clarity	<div><div></div><div></div><div></div><div></div></div>
Differentiation	<div><div></div><div></div><div></div><div></div></div>

Feedback

Concept	<div><div></div><div></div><div></div><div></div></div>
Focus	<div><div></div><div></div><div></div><div></div></div>
Conspicuity	<div><div></div><div></div><div></div><div></div></div>
Clarity	<div><div></div><div></div><div></div><div></div></div>
Differentiation	<div><div></div><div></div><div></div><div></div></div>

Feedback



Feedback

Work to date...



Microwave



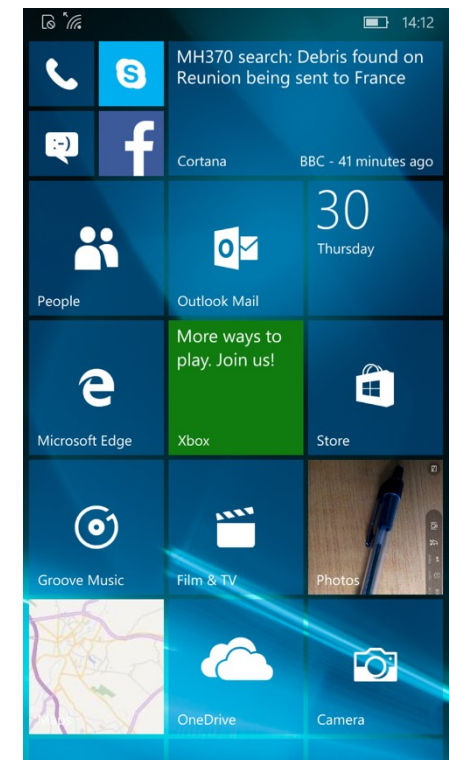
Set-top
Box



Car HVAC

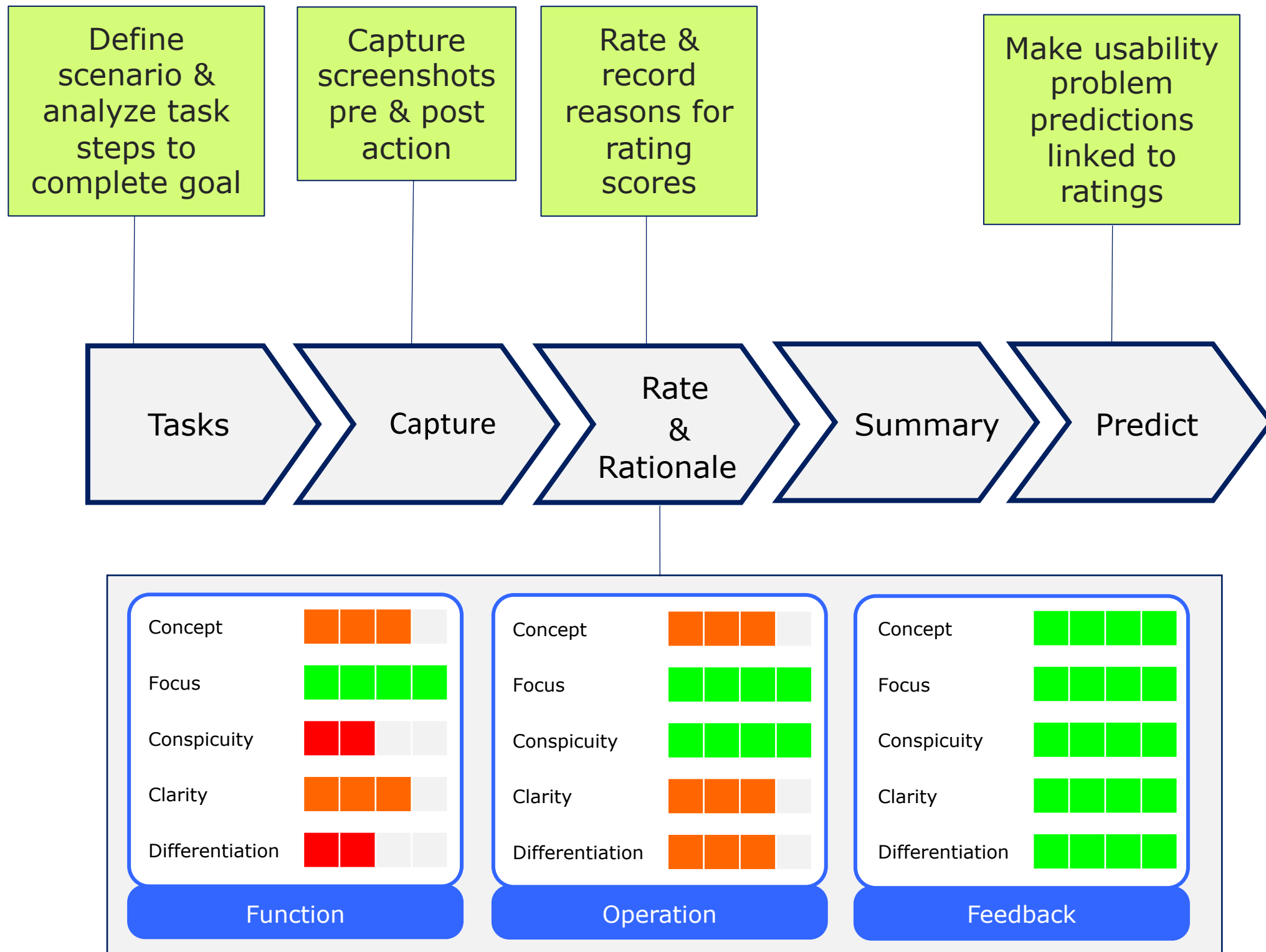


Running
Watch



Smart phone

The process



The Toolkit



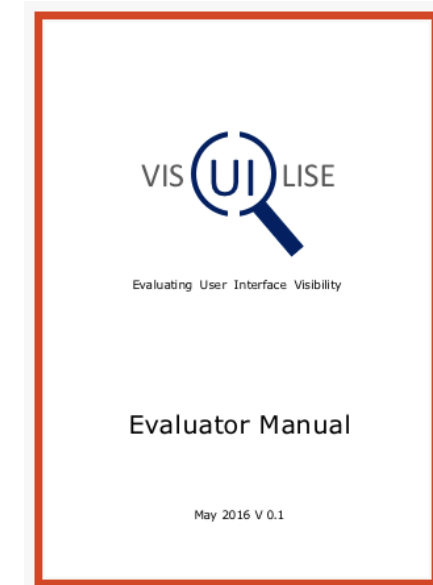
Introductory
Presentation

Visibility Review

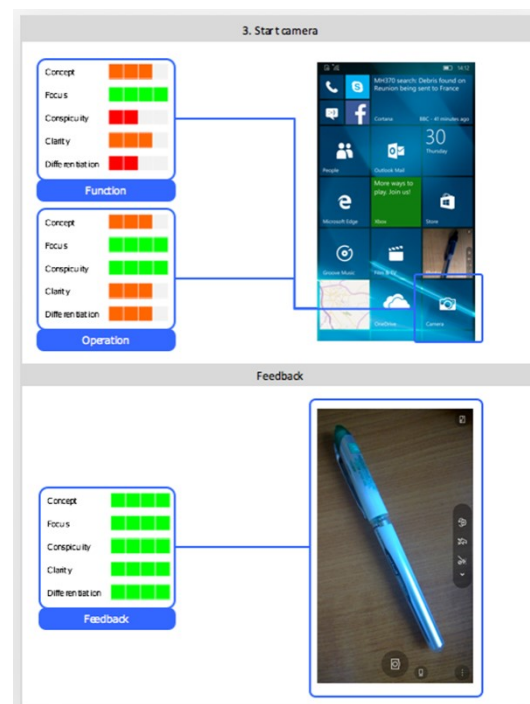
<Insert product picture here>

Product Name	
Model	
Reviewer	
Date	

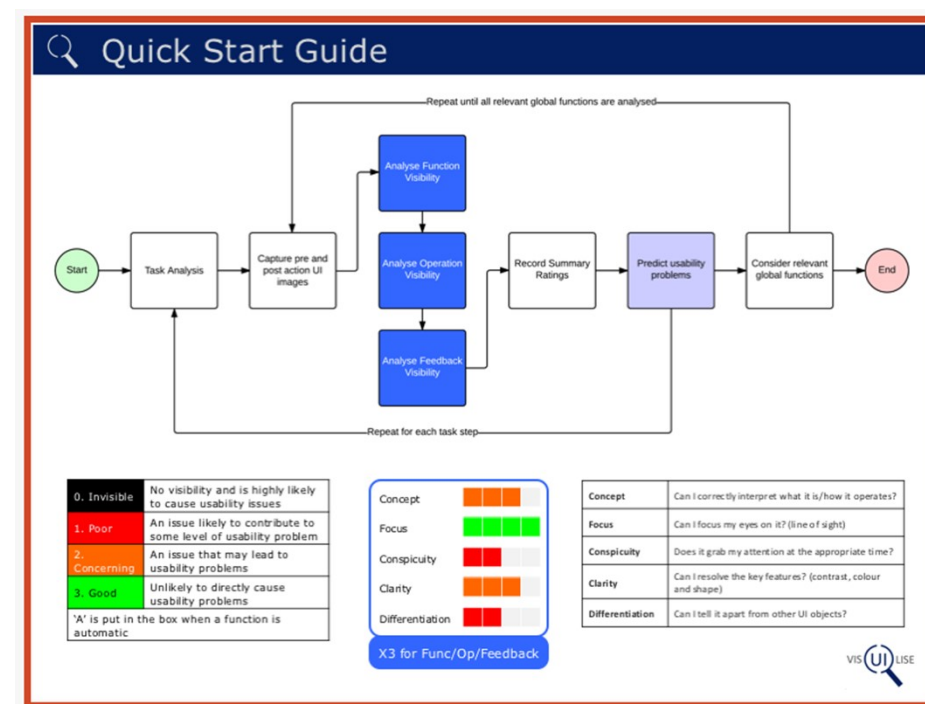
Analysis Template



Evaluator Guide



Example

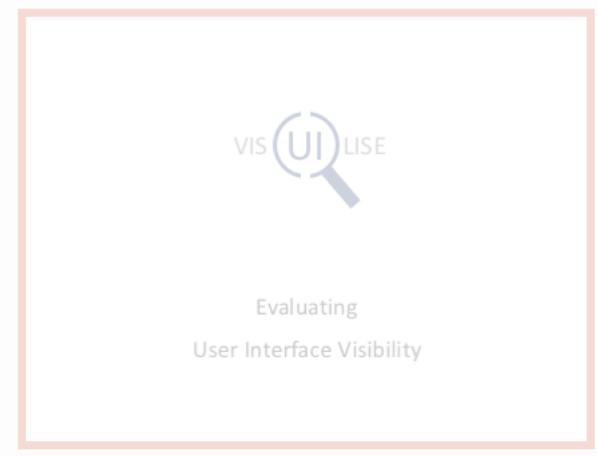


Quick reference
card



Break Time!

The Toolkit: The Template



Introductory
Presentation

Visibility Review	
<Insert product picture here>	
Product Name	
Model	
Reviewer	
Date	

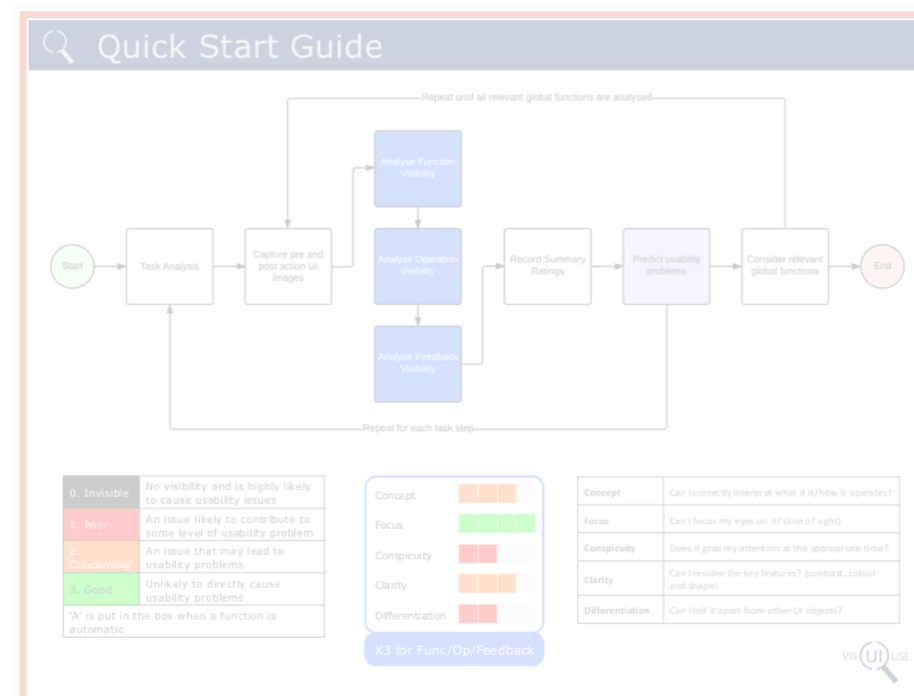
Analysis Template



Evaluator Guide

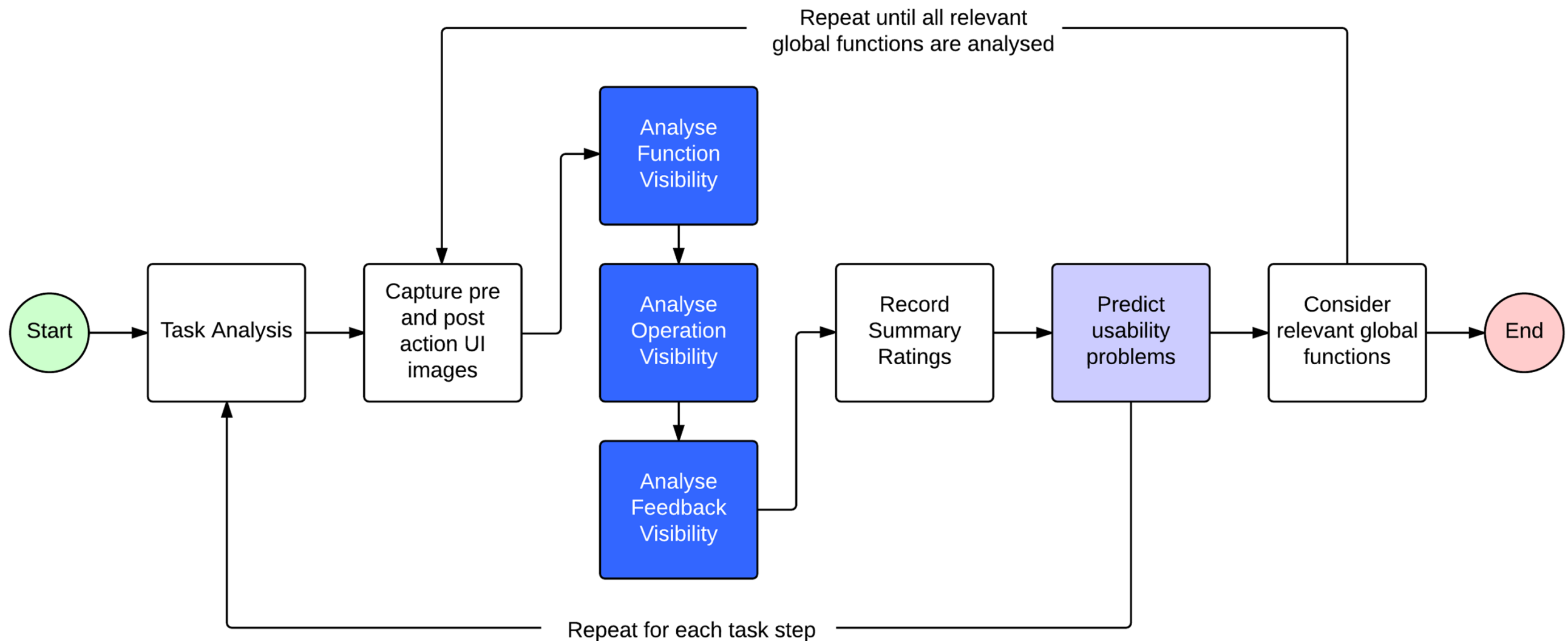


Example

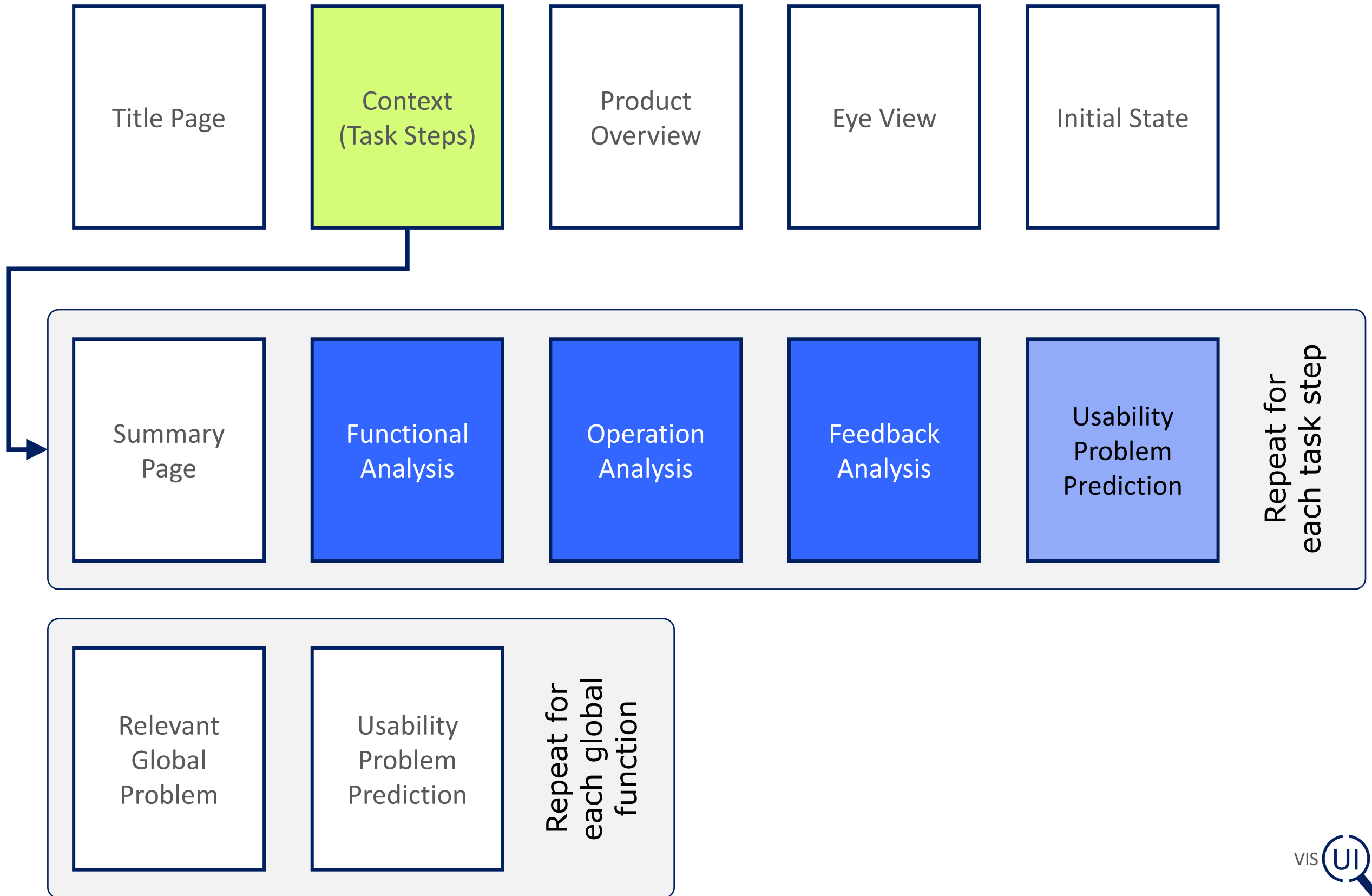


Quick reference
card

The Core Process



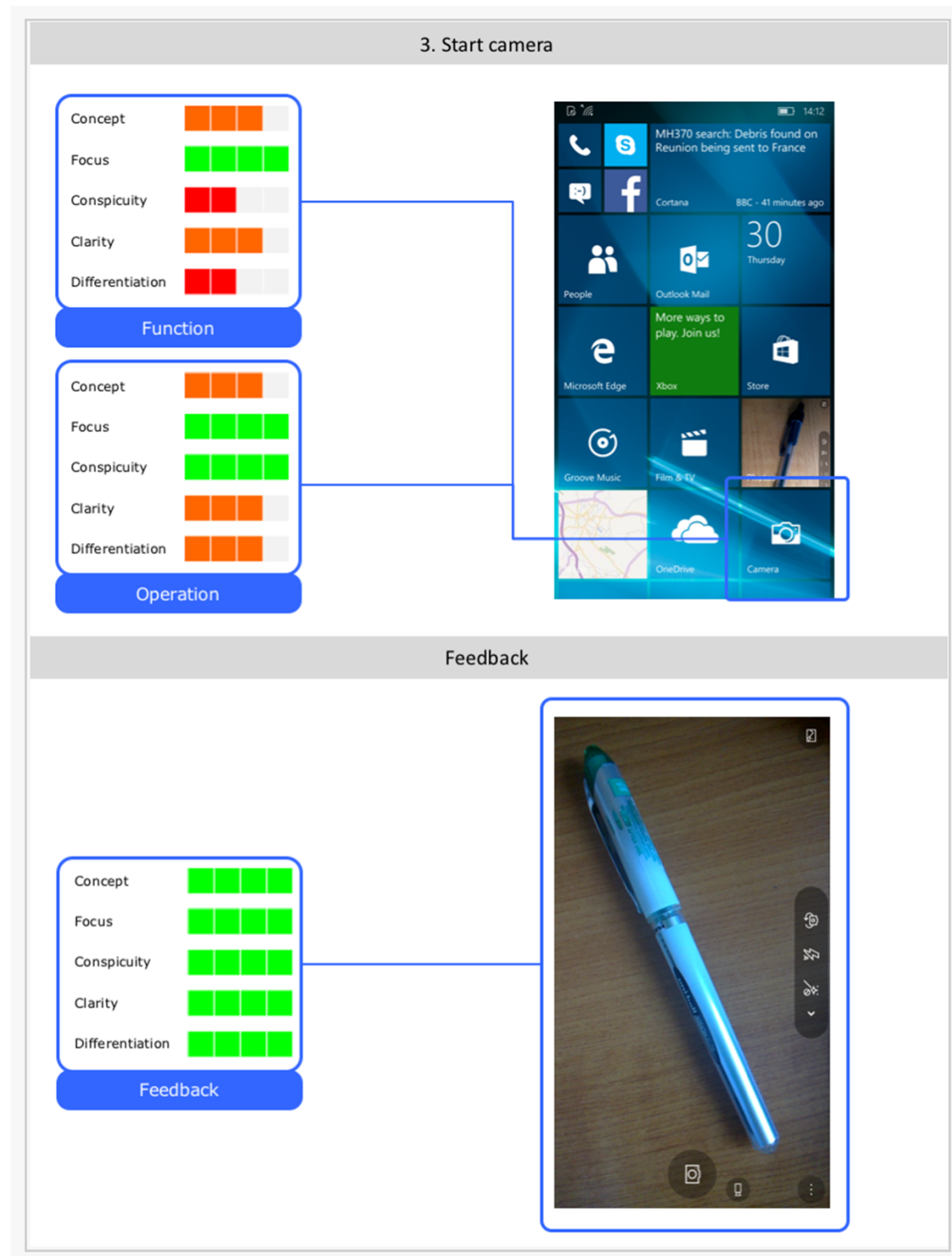
Understanding the Template



The Summary Page



Summary of Ratings from core analysis
N.B. the level is the worst score from the sub questions (see next slide)



Layout can be changed to suit different UI form factors

Pre and post action images of UI

The Core Analysis



Function

FUNCTION ANALYSIS: Start camera								
Aspect	Question	Answer	Score					
Concepts								
	What is the concept of the 'function'?	Press camera app (OR shortcut via camera on/shutter button)						
	How is the concept conveyed visually?	Tile with camera graphic and text (OR silver button)						
	Is it a familiar concept to the user? (check against real examples)	Users are typically familiar with apps						
	How well is the concept represented & are there elements missing ?	There is a graphic and text						
	Are there general variations of this concept that could cause confusion ?	There is a shortcut via camera on/shutter button						
Line of sight & focus								
	Does the user have to move to get line of sight?	No (unless using shutter button shortcut)						
	Can the user focus on it? (bi or vari focal glasses)	Yes						
Conspicuity								
	Is it in the central visual field?	Lower right of screen (unless using shutter button shortcut)						
	Is it where the user would expect it to be?	Depends on prior experience of devices with cameras						
	How many other related elements are there?	16 other apps						
	Does it stand out against other elements/background?	Most tiles are the same colour						
Clarity								
	What are the key distinguishing features?	<table><tr><th>Size</th><th>Contrast</th></tr><tr><td>Medium</td><td>Fair</td></tr></table>	Size	Contrast	Medium	Fair		
Size	Contrast							
Medium	Fair							
	Camera icon	Medium	Fair					
	Label text "Camera"	Small	Fair					
Differentiation								
	How different is it from other elements visible at the same time?	Most tile icons have the same background colour						
	How different is it from other elements visible at other times?	Tile icons off screen often have the same colour						
	Could it be confused with commonly used graphics/symbols that indicate something different?	Camera icon could be used to depict photo library on other devices						

Operation

OPERATION ANALYSIS: Start camera							
Aspect	Question	Answer	Score				
Concepts							
	What is the concept of the 'operation'?	Press application icon					
	How is the concept conveyed visually?	Square tiles in a grid arrangement.					
	Is it a familiar concept to the user? (check against real examples)	Touch devices typically have an array of apps in a grid					
	How well is the concept represented & are there elements missing ?	Not overtly a button					
	Are there general variations of this concept that could cause confusion ?	The buttons are rounded on iOS and both Android and iOS have the text underneath and not as part of the icon					
Line of sight & focus							
	Does the user have to move to get line of sight?	No					
	Can the user focus on it? (bi or vari focal glasses)	Yes					
Conspicuity							
	Is it in the central visual field?	Yes					
	Is it where the user would expect it to be?	Yes					
	How many other related elements are there?	Once the app has been identified the focus is on the tile so none					
	Does it stand out against other elements/background?	Once the app has been identified the focus is on the tile					
Clarity							
	What are the key distinguishing features?	<table><tr><th>Size</th><th>Contrast</th></tr><tr><td>Small gap</td><td>fair</td></tr></table>	Size	Contrast	Small gap	fair	
Size	Contrast						
Small gap	fair						
	Tile edges	Small gap					
Differentiation							
	How different is it from other elements visible at the same time?	The tile edges are close to other surrounding tiles					
	How different is it from other elements visible at other times?	The tile edges are close to other surrounding tiles					
	Could it be confused with commonly used graphics/symbols that indicate something different?	Nothing obvious. Square grid layouts are used for photo browsers but the tiles do not look like photos.					

Feedback

FEEDBACK ANALYSIS: Start camera							
Aspect	Question	Answer	Score				
Concepts							
	What is the concept of the 'feedback'?	The camera image (rear facing) is displayed					
	How is the concept conveyed visually?	The camera image takes over the whole screen and changes in real-time					
	Is it a familiar concept to the user? (check against real examples)	Digital cameras have displays					
	How well is the concept represented & are there elements missing ?	Nothing obvious					
	Are there general variations of this concept that could cause confusion ?	Nothing obvious					
Line of sight & focus							
	Does the user have to move to get line of sight?	No					
	Can the user focus on it? (bi or vari focal glasses)	Yes					
Conspicuity							
	Is it in the central visual field?	Yes					
	Is it where the user would expect it to be?	Yes					
	How many other related elements are there?	Takes over whole screen					
	Does it stand out against other elements/background?	Takes over whole screen					
Clarity							
	What are the key distinguishing features?	<table><tr><th>Size</th><th>Contrast</th></tr><tr><td>Whole screen</td><td>Camera image</td></tr></table>	Size	Contrast	Whole screen	Camera image	
Size	Contrast						
Whole screen	Camera image						
	Camera image	Whole screen					
	Camera controls	Varying size	Depends on image behind				
Differentiation							
	How different is it from other elements visible at the same time?	Takes over whole screen					
	How different is it from other elements visible at other times?	Takes over whole screen					
	Could it be confused with commonly used graphics/symbols that indicate something different?	Not obviously					

Concepts

	What is the concept of the 'Func/op/fbck'?
	How is the concept conveyed visually?
	Is it a familiar concept to the user? (check against real examples)
	How well is the concept represented & are there elements missing ?
	Are there general variations of this concept that could cause confusion ?

Line of sight & focus

	Does the user have to move to get line of sight?
	Can the user focus on it? (bi or vari focal glasses)

Clarity

	What are the key distinguishing features?	Size	Contrast
	<feature 1>	<large/medium/small>	<high/medium/low>
	<feature n...>	<large/medium/small>	<high/medium/low>

Differentiation

	How different is it from other elements visible at the same time?
	How different is it from other elements visible at other times?
	Could it be confused with commonly used graphics/symbols that indicate something different?

Conspicuity

	Is it in the central visual field?
	Is it where the user would expect it to be?
	How many other related elements are there?
	Does it stand out against other elements/background?



Usability Problem Prediction

Task Step:				
Issue	Visibility problem	Probability	Impact	Rationale
The user may not identify the camera app at all	Conspicuity and Differentiation	Low	High	There any other apps with the same colour background
The user may select another app e.g. photos	Differentiation	Low	High	The number of apps and the differentiation between photos and camera may confuse
The user may attempt to find a dedicated camera button and try the other silver buttons (volume & lock)	Differentiation	Low	Medium	Other phones have this feature and it may lead the user to do it. Trial and error will help them overcome this.

Special Cases: Automated Actions

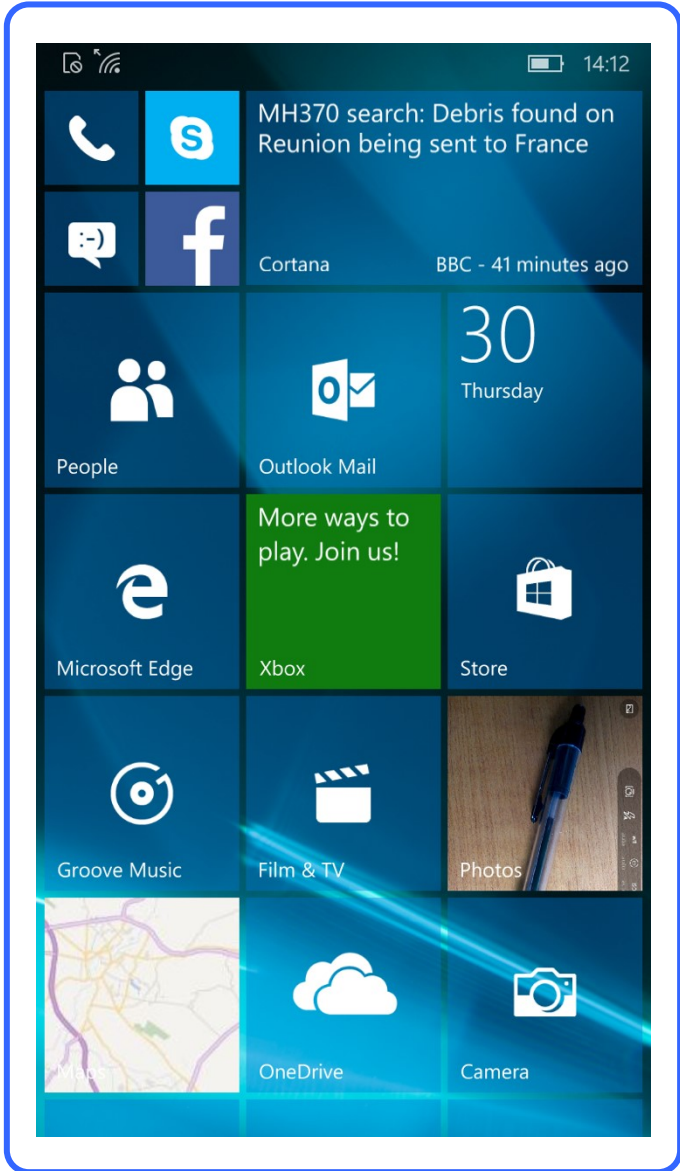
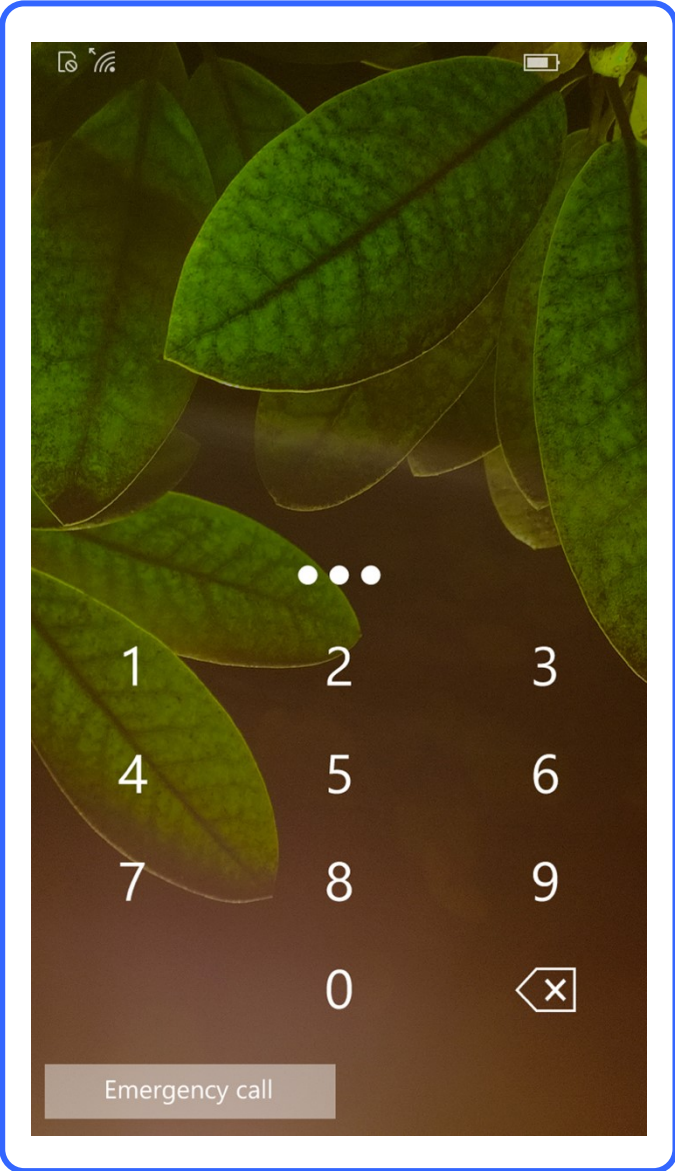


Concept	A	U	T	O
Focus				
Conspicuity	A	U	T	O
Clarity	A	U	T	O
Differentiation	A	U	T	O

Function

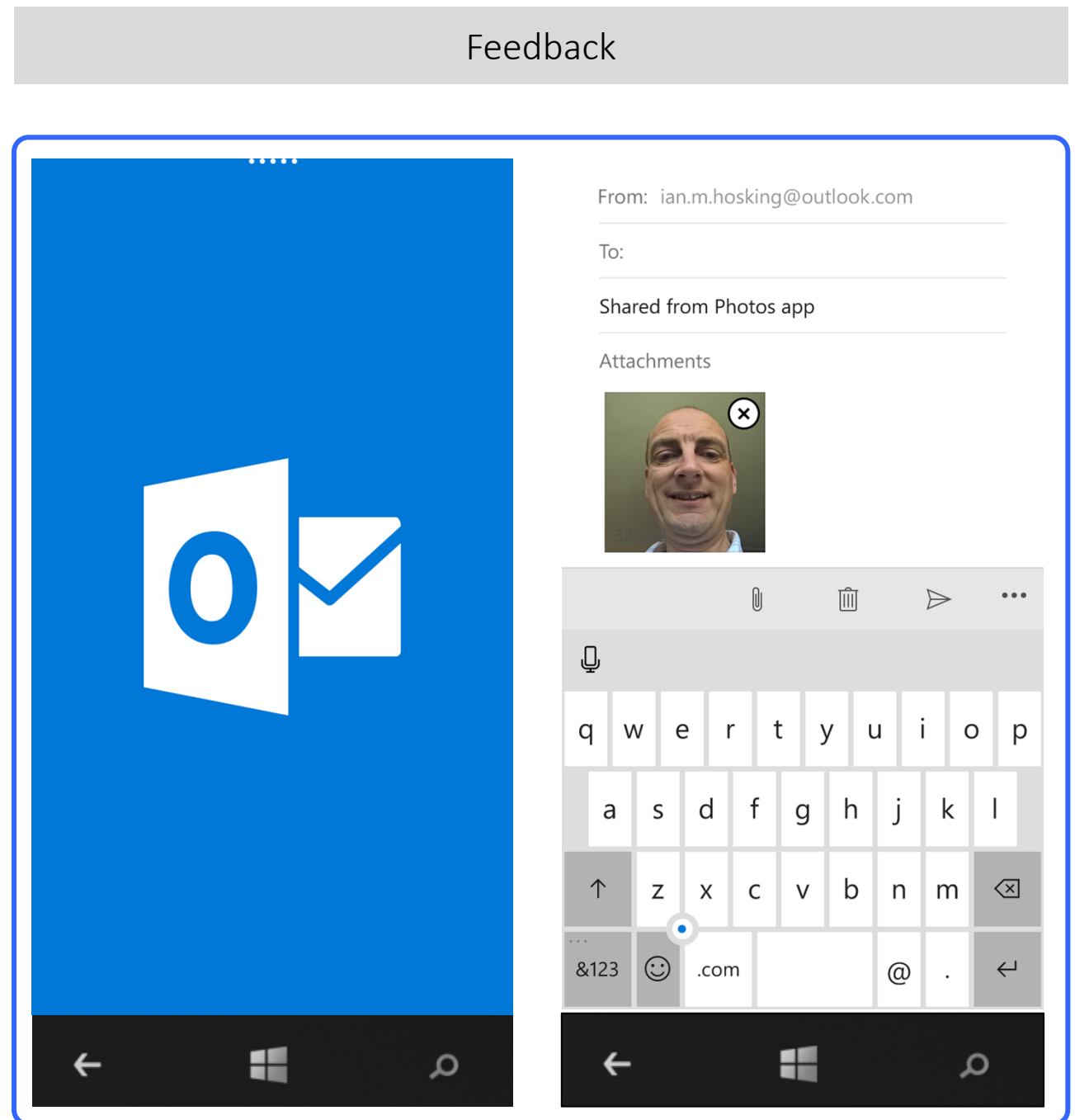
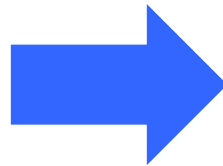
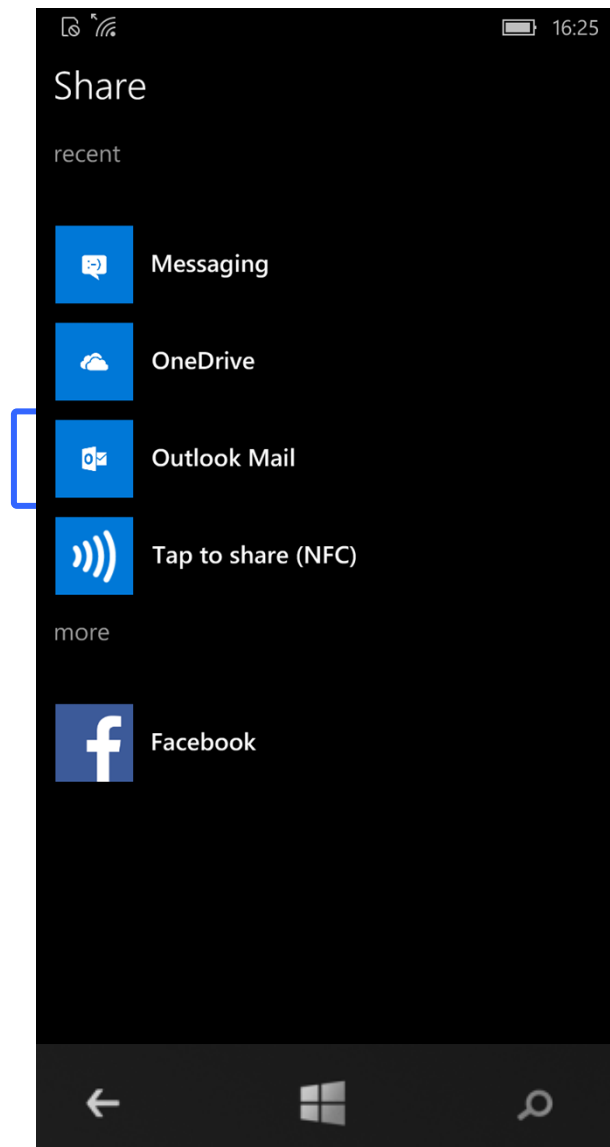
Concept	A	U	T	O
Focus				
Conspicuity	A	U	T	O
Clarity	A	U	T	O
Differentiation	A	U	T	O

Operation



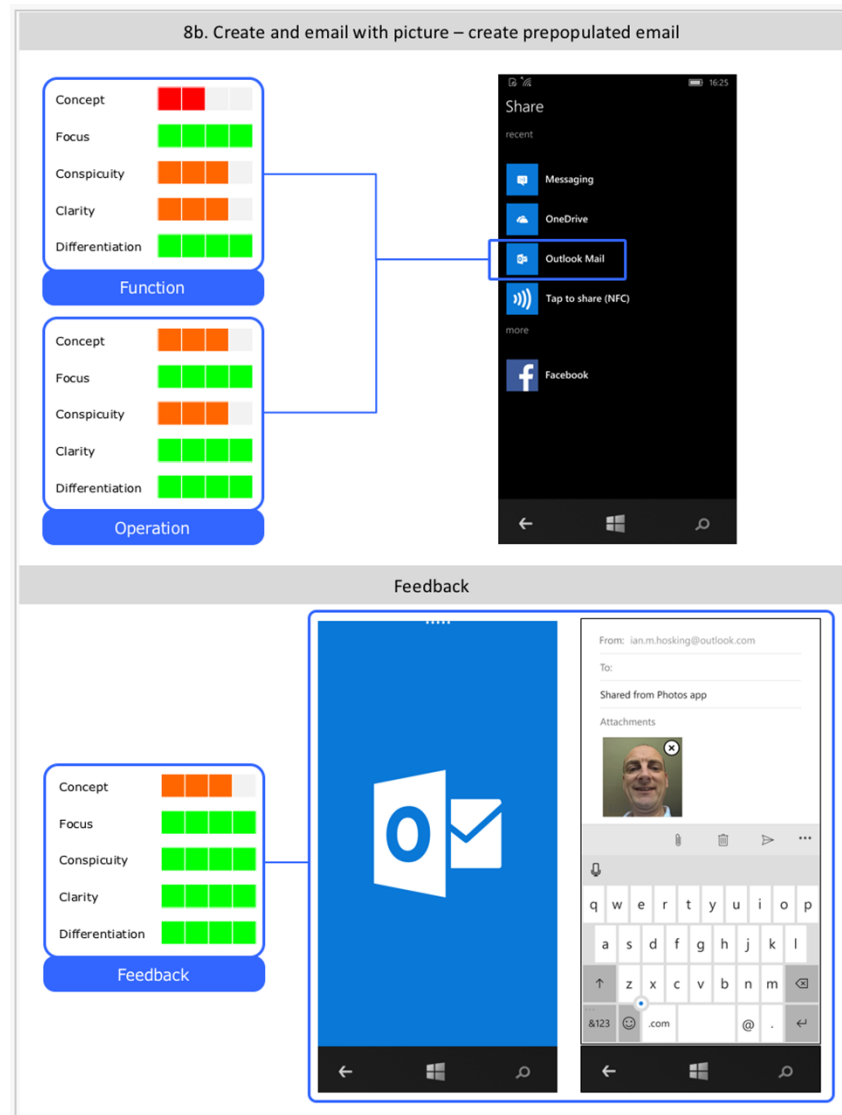
In this example when the final number of the PIN is entered the phone automatically checks it. There is no 'ok' button as there is with SIM PIN entry

Special Cases: Feedback Sequences



Record key elements of the feedback sequence

Template Layout

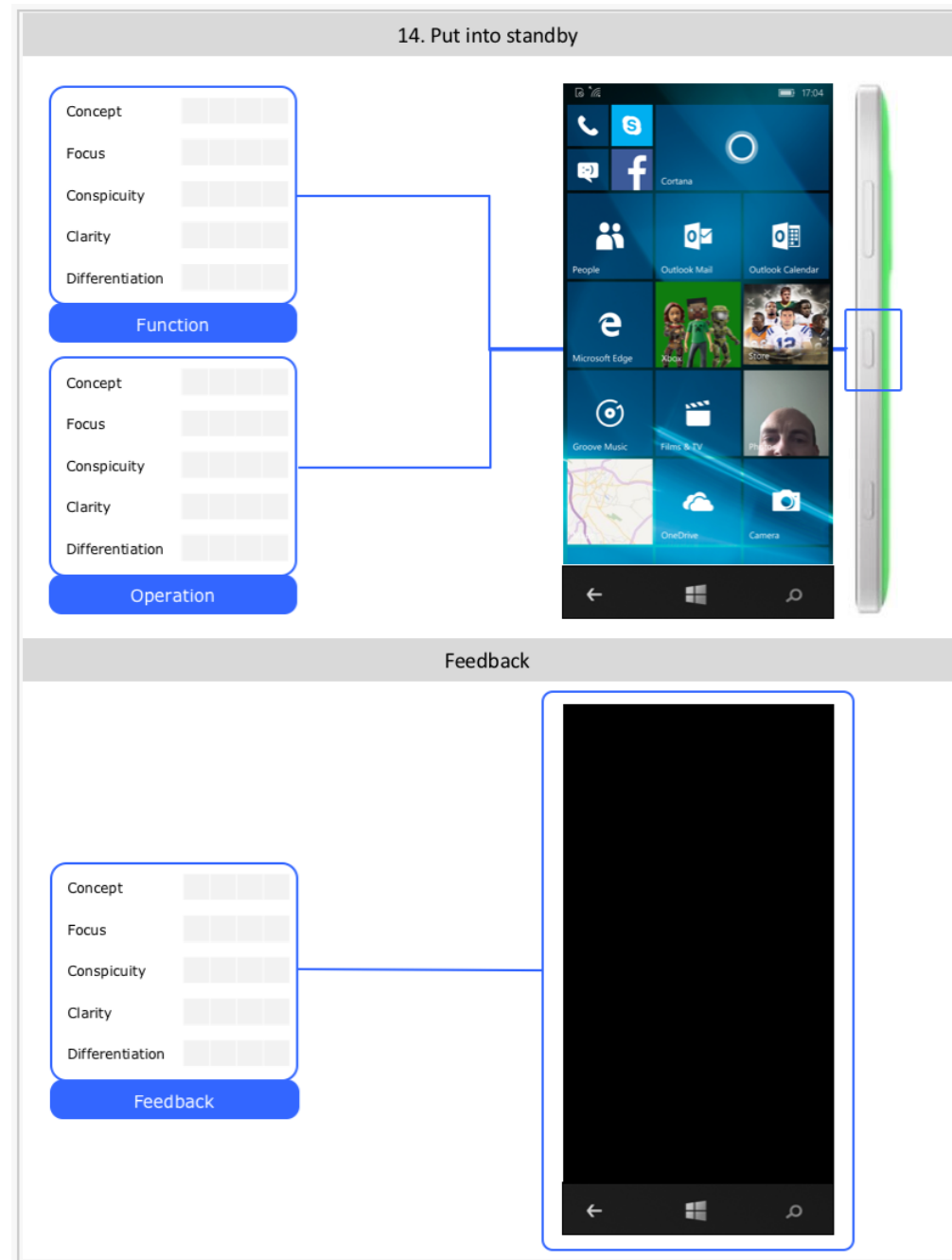


A3 Portrait

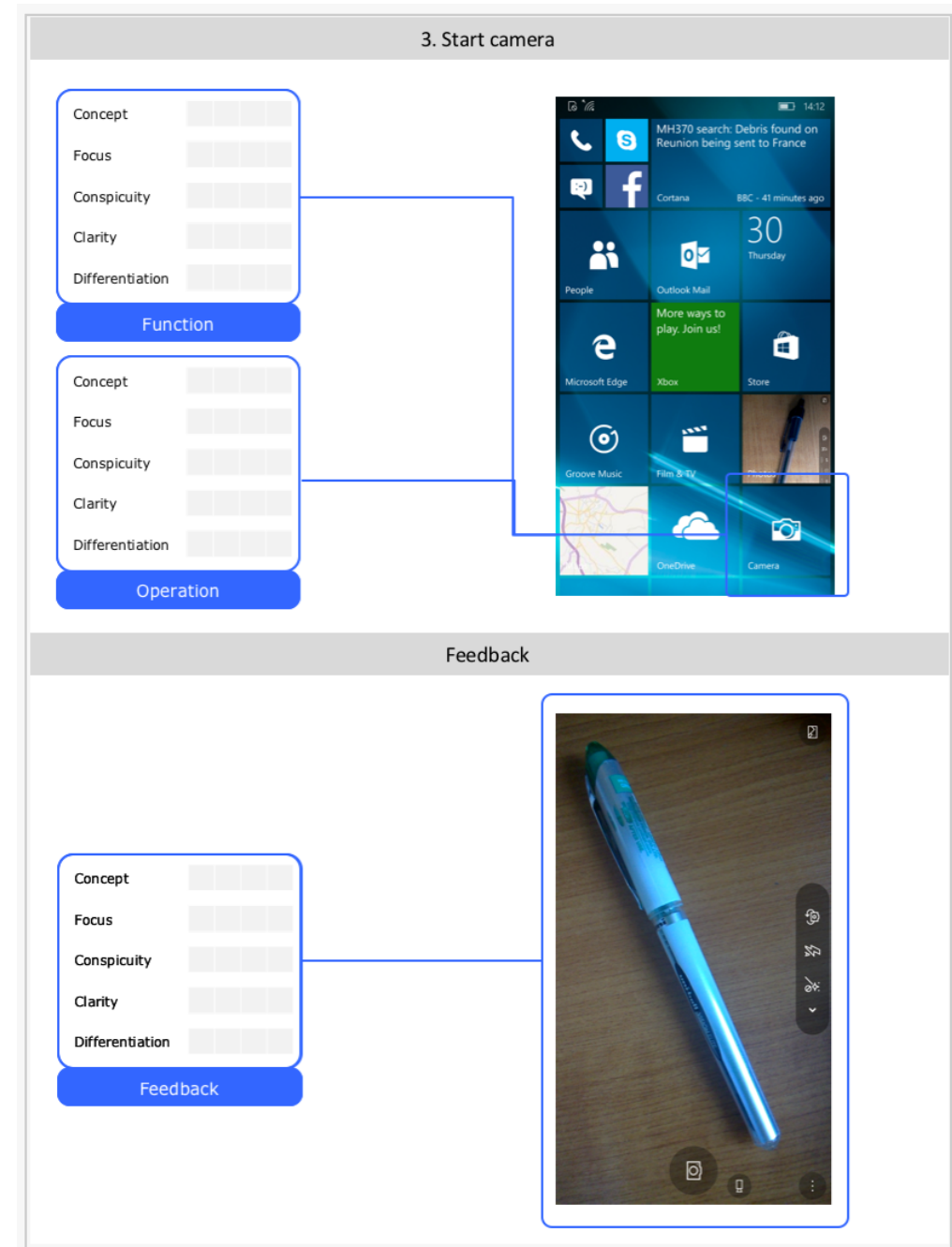


A3 Landscape

Have a go...



Putting phone into
standby mode



Starting the camera



Evaluating User Visibility