Inclusive Design Principles and Interface Design

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Designing acceptable interfaces through inclusive design

- Need to counter design exclusion

Design examples:
- Assessing design exclusion
  - Kiosks
- Countering design exclusion
  - Computer access for motion-impaired users
Designing for Inclusivity - I

What is good inclusive design?

- A good inclusive design is one which only excludes...
  ...
  ... those who the product requirements exclude
We must first ask:
• **How** are people excluded?

Followed by:
• **How many** are excluded?

And finally:
• **What** can we do about it?
The Inclusive Design Cube - Modelling the population

Whole population

Included population

Increasing sensory capability

Increasing cognitive capability

Increasing motion capability
What is a good interface?

- Acceptable by the intended user group

Need to define:
- What is the intended user group?
- What is acceptable?
Who are the intended users?

Typical user stereotypes

• The “disabled”
• The “elderly”
• The “person in the street”
• The “customer”
Who are the intended users?

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Designing for accessibility - What is different?

“Designers design for themselves”

- Capabilities
- Experience
- Education
- Expectation
- Attitudes
What is a good interface?

• Acceptable by the intended user group

Need to define:
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• What is acceptable?
Designing accessible interfaces - What are we aiming for?

Acceptability

Practical
- Utility
- Usability
- Accessibility

Social
- Aesthetics
- Stigma
- Usefulness
- “Street-cred”
Acceptable interfaces? - 1
Acceptable interfaces? - II
Designing acceptable interfaces

Strongly user-centred design practices

needs

Good understanding of user behaviour

needs

Good understanding of interaction cycle
The interaction cycle

1 - Given users - what product features?

2 - Given product features - what users?

APPLICATION: PRODUCT / SERVICE

HARDWARE  SOFTWARE

INTERFACE

USER
The inclusive design knowledge loop
The inclusive design knowledge loop

- Data representation
- Information users
- End-users
- Products/services
The inclusive design
knowledge loop

- Know the user
- Data representation
- Verify the data/Validate the product
- End-users
- The Knowledge Loop
- Information users
- Verify the product/Validate the data
- Products/services
- Inclusive Design
Example

Assessing design exclusion
Kiosk design

- Evaluated by Royal Mail
- 1 in 7 Royal Mail customers “disabled”
- Strong bias towards over-60s
- Must comply with DDA
- … and lead by example
The concept Information Point

Input

Output
The Information Point assessment

Sensory assessment
• Screen too high and not adjustable
• Audio output not duplicated
• Visual output not duplicated

Motor assessment:
• Need to stand
• Reaching and dexterity demands

⇒ 45% of target population excluded
Level 2 population coverage

Level 3 population coverage

Level 4 population coverage

Estimated lower bound

Estimated upper bound

User-aware design

Current design

Needing assistance
The “Your Guide” kiosk
The “Your Guide” kiosk
The “Your Guide” kiosk
“Your Guide” user trial results

• Kiosk hardware fundamentally more accessible
• Software interface not accessible
  • Ambiguous icons
  • Poor keyboard emulator
  • Screen / list layout
  • Insufficient contrast
  • Poor design assumptions
Designers design for themselves...
Example

Countering design exclusion - Designing an accessible input system through ‘knowing the user’
Computer access for motion-impaired users

Symptoms:
• Tremor
• Spasm
• Restricted motion
• Reduced strength
• Poor co-ordination
Controlling the cursor

• GUI paradigm requires cursor control
• “Point and click”

• Needs:
  – gross motor control (ballistic)
  – fine motor control (homing)

• Difficult for motion-impaired users
Modelling the user behaviour

• Typically only Movement Time ($MT$) and error rates reported

• These explain *that* differences exist…
  … not *why* they exist

• If we know *why* there are difficulties, then it is easier to propose solutions
Cursor measures - I

- Target Re-Entry (TRE)
- Task Axis Crossing (TAC)
The cursor measures - II

- Movement Direction Change (MDC)
- Orthogonal Direction Change (ODC)
The cursor measures - III

- **Movement Time** ($MT$)
  - time to complete the task
- **Throughput** ($TP$)
  - ratio of index of difficulty to Movement Time
- **Missed Click** ($MCL$)
Improving access

Question -

• Can we improve ‘point and click’ performance?
User trials II -
The experimental set-up

• ISO 9241-9 multidirectional point-select task
The haptic experiment -
Experimental set-up
The haptic experiment -

Background

• Gravity wells may help
The haptic experiment -
Example cursor plots

Without assistance

With assistance

Target
The haptic experiment -

Question

• **Question** - How do gravity wells improve interaction?
The haptic experiment -
Conclusions

Throughput ($TP$) improves because:

- Movement Time ($MT$) decreases because:
  - ability to select the target improves ($TRE$ & $MCL$ reduced); and
  - movement towards the target is more effective ($MDC$ reduced)
The haptic experiment - Explanation

Without assistance

With assistance
Summary

• We want to make interfaces as accessible and inclusive as possible

• Can be achieved through ... countering design exclusion