

## Older people and younger designers

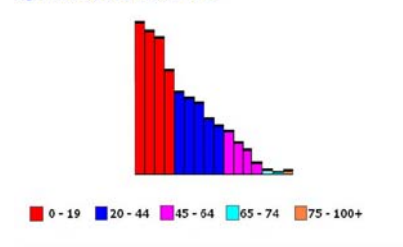
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### Are older people relevant?

The issues around older users

- Elderly people are an increasing part of population . . . at the same time . . .
- Computer access is becoming a condition of full participation in society
- But some older people:
  - Are not able to work comfortably with mainstream software
  - Have relatively undemanding computing needs
  - Have limited financial resources
  - Are novices and / or perpetual newbies
- We need to understand how to build usable computer interfaces for older people

Age distribution before 1900



Age distribution in 1961

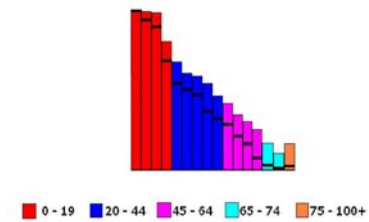


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Age distribution in 2001

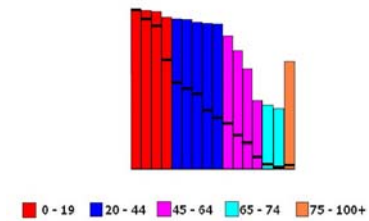


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Age distribution in 2021

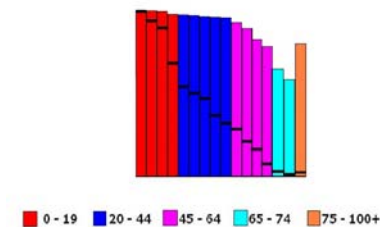
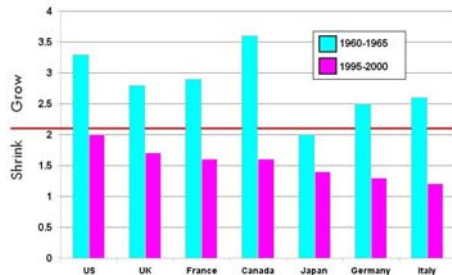


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Family size - 1960 compared with 1995



### What do we face as future older users?

#### Temporary problem or long term issue?

- We are the next generation(s) of older people
- We have much more computing knowledge than the current older generation

But ...

- We face decline in some of:- vision, manipulation, attention, memory, ability to learn
- We will have reduced or different computing needs with retirement
- Expertise in older people seems to involve narrow skill sets that do not automatically expand to closely related skills
- The next generation of applications will always be built by and for the next generation of young users
- We will probably prefer applications that are similar to those we were familiar with in our 50s.

#### What is our future?

- Mainstream applications will continue to be designed for the market sweet spots, not for older people

But ...

- Building simple versions of well established applications is relatively simple
- The adaptations needed to make these into suitable applications for older people are not rocket science
- The niche market for older users will be a sizable niche market
- It should be one that is reasonably well supplied

### Designing for older people

#### Designing for older people

- Older people are different from young designers
- Designers work from their own assumptions - again and again
- Each finding on aging is a departure from what you can reasonably assume about younger people
- To escape what you assume you will have to work with older people

#### Designing for older people needs:

- Some understanding of aging
- Working with older people throughout design
- Design guidelines on how to compensate for aging effects

#### Designing for older people needs:

- Some understanding of aging
  - Book learning
  - Experience with groups of older people
- Working with older people throughout design
  - Working with older people is a skill
  - Easy to do wrong
  - Lots to be gained
- Design guidelines on how to compensate for aging effects
  - Reduce features
  - Cognitive simplicity
  - Layout and text - large, clear, simple
  - Guidelines are not enough by themselves

#### Working with older people is a skill

##### Working with older people is a skill - 1

- It is too easy to push an older person into agreeing with you
- Work with groups of older people, learn their way of working rather than pushing your approach
- Groups shift the power balance so you learn more about the older people rather than about what they think you want

##### Working with older people is a skill - 2

- Slow down, older people get lost with too many ideas at once
- Avoid jargon AND avoid being patronizing
- Expect many gaps in very basic knowledge
- Be respectful
- Do not try and fill too many gaps at once

- Use credible hi-fidelity prototypes
- Observe where older people struggle with standard applications

### Working with older people is a skill - 3

- Demonstrations and training
  - Do not cover too much
  - Be aware of the point that your own skills are automated and so easier to do than explain
  - Do demonstrations slowly talking about each action
  - Work from beside older person so they are in front of screen
  - Follow your demonstration by older person carrying out a guided repeat several times until they can do it without guidance
  - Let older person make notes in their own words
  - Be prepared for what is learnt to be forgotten

### Housekeeping

#### Housekeeping issues

Some of the points in the next two slides may sound trivial or nit-picking but the points listed do address older people's issues in attending new venues and the result was happy and co-operative participants.

#### Housekeeping issues - Pre session

- Ensure clear prior understanding of what is involved.
  - I had a short telephone conversation with each volunteer to check that they met the project criteria and understood what was involved.
  - I told them I would send a letter confirming the details
- Be ruthless about excluding people who do not meet the criteria
- Some older people forget easily.
  - Send a confirming message giving clear written information given about dates, locations, accessibility, parking and contact information
  - Send a reminder shortly before testing cycle begins
- Session times set to avoid traffic peaks

#### Housekeeping issues - Session format

- New locations are difficult for seniors. Accessibility, nearby reserved parking and signage trails are important. Reception staff were alerted to direct participants if they got lost.
- Session times 50 min then tea break then another 50 min
- The research area was new, tidy and well furnished
- Attention was paid to lighting and adjusting seating, keyboard and screen position. Mice were cleaned and checked.
- Nearby toilet locations were pointed out at the start of sessions.
- Tea breaks provided a varied choice of good quality biscuits. Range of cup sizes.

### Selection Bias

#### Selection bias - 1

- Volunteers for research projects in general tend to be more intelligent, of higher status, more articulate and more self-confident than the community average.
- Effect probably stronger for older volunteers - factors such as the need to cope with city driving, greater range of ability.

#### Selection bias - 2

- In the FileTutor study there were a "more average" subgroup of 7 who were more typical of the general community.
- This group had more difficulties and were of considerable value in showing areas in which FileTutor could be improved.
- The "above average" volunteers:
  - Were more able to cope with the problems in the earlier versions of FileTutor
  - Identified things that might cause difficulties for other older people
  - But did not spot many of the pitfalls that the "more average" participants exposed.
- A strategy for acquiring a "more average" group seems particularly valuable in usability testing with seniors.

### Ethical Issues

#### Ethical issues in using older people in research - 1

- Levy (1996) has shown effects of activating negative self stereotypes in older people.
- These include physiological stress and negative influences on long term decision making.
- Hence failing at apparently harmless computer activity may breach the ethical commitment to protect the volunteers' personal welfare.
- The study's orientation, design, briefing and de-briefing procedures must help volunteers to ascribe blame to the experimental setup rather themselves.
- A problem here is older people's apparent use of self blame as a coping mechanism. The "silly old me" syndrome.

#### Ethical issues in using older people in research - 2

- The FileTutor project was designed to maximize success while placing a positive construction on difficulties.
- Participants saw themselves as making a useful contributions in pointing out where they had become stuck.

- On coming to later sessions they could in fact see that improvements had been made based on the problems they had identified.
- Participants reported that their self confidence was boosted.

### Prototyping with older people

#### Prototyping for older people

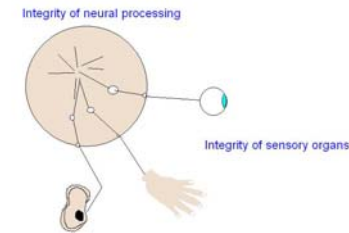
- The initial prototype needs to be credible
  - Older people are easy to turn off when they expect computing to be difficult
  - Solve problems you have already observed in older users and create hope and interest
- You need a hi-fidelity prototype
  - Breaks the rules of good interface design
  - Older people do not make the leap from paper prototype to how a screen would look and work
  - Some of the key factors that make a good design for older people are not captured in a lo-fidelity prototype

#### Usability testing with older people

- Lots of short sessions as you design
- Informal sessions with groups ("Computerware" parties) can be very useful but observation can be hectic
- Lab sessions may tend to overwhelm older people
- Beware of older people "blessing" your designs, "this is a wonderful design, its very clever and it should be very good for older people (<unspoken> except for silly old me)" Since this is in fact exactly what I do want to hear, as distinct from what I need to hear, this message is seductive.
- Try presenting alternative design fragments as a way of having older people tell you what is better or worse without asking them to disappoint the designer

### Effects of aging

Image goes here - Location of aging.JPG



### Design for older users

Within the older population there are significant numbers of people who show ...

Poor vision      Reduced visual search skills

Poor mouse control      Risk aversion      Slower processing

Forgetfulness      Learning difficulties

Confusion in response to complex systems

Concrete thinking      Difficulties with novelty . . .

Hence designs for older users should have ...

- Large fonts, high contrast, minimal distraction
- Reduced screen content, full screen displays
- Simplified manipulation
- Severely limited feature set
- Simple search and navigation patterns
- Minimal learning

### Vision and Aging

#### Vision and aging

- Early problems from around 40
  - Near focus difficulties - bifocals, slow focus shifts
  - Fine detail lost
  - Reduced sensitivity to color - esp. blue-green
  - Visual search slows
  - Visual processing slows
  - Glare sensitivity increases

- Later problems from around 60
  - Narrower visual field, stronger stimuli needed at edges
  - Flicker detection declines
  - Poorer depth perception
  - Minimal movement is not detected

#### **Vision in older people and HCI design - 1**

- Best text :
  - Large, 11 - 14 point, sans-serif fonts
  - Black on white background
  - Avoid - colored or fancy text, colored and patterned backgrounds
- Allow for slower reading and understanding
- Simplify visual search, provide extra, bolder cues
- Allow for slowed visual search
- Emphasize layout simplicity, clarity and consistency

#### **Vision in older people and HCI design - 2**

- Beware of glare
- Avoid sharp lighting contrasts between screens
- Do not ask for rapid shifts in focal distance
- Allow for reduced color discrimination, esp. in blue - green range
- Do not rely minimal movements to indicate change
- Allow for poor depth perception
- Do not ask users to combine information across wide visual spaces

#### **Movement and Aging**

##### **Movement and older people**

- Slow, cautious
  - Movements slower, jerkier, more sub-movements
  - Increased caution in movement strategies
  - Slower verification of movement success
  - Longer pauses after errors
- Less accurate
  - Hard to make accurate fine movements
  - Less ability to control forces applied
  - Hand writing less distinct, harder to sustain
- Less accuracy in reporting body position
  - Balance problems
  - Greater problems with complexity
  - Complexity of movement interacts with age, slower, less accurate, more cognitive effort involved, harder to learn
- Possible problems with acquiring new information during movement

#### **Psychomotor Abilities in older people and HCI Design**

- Check movement required by interface for :
  - speed dependency - eg double clicks , menus
  - complexity - e.g. multi-source input
  - demands on accuracy - e.g. menus, text insertion
- Benefit from redundant confirmation of target capture?
- Payoff from easily available undo / redo?
- Watch for problems in learning new, complex movements
- Ability to control fine or complex movement may affect novel input devices - eg. touch pad mouse
- Data gloves affected by poor perception and application of forces?
- Handwriting recognition problems?
- Vision and balance problems in virtual environments?
- Consider the timing of complex movement in relation to the cognitive effort of the underlying task - is there competition?

#### **Speech, Hearing and Aging**

##### **Hearing and Speech in older people**

- Hearing
  - General decline in hearing
  - More pronounced losses for higher tones
  - Meaning lost as key consonants missed
  - ( f, s, t, z are high pitched )
  - Less ability to filter out background noise
  - Problems switching between spoken and visual text input
  - Slowing of auditory processing and reaction
  - Inability to cope with speech when speeded up
- Speech
  - Speech becomes less distinct
  - Poorer planning, more problems finding words
  - More pauses and fillers
  - Slower to achieve precise sounds
  - More effects from respiratory complaints

##### **Hearing, Speech in older people and HCI Design**

- Spoken output ( hearing machine speech ) problems
  - Losses in higher tones - use low pitched voices
  - Poorer recognition of synthesized speech
  - Problems with environmental noise
  - May be problems combining spoken audio and visual text information
  - Speech gives user more to remember, is harder to review, forces the pace at which users work

- Spoken input ( speech recognition ) problems
  - Can system cope? Indistinct speech, audible breathing, more fillers, voice changes due to respiratory illness.
  - Older users may find it harder to train themselves to speak in way system can manage
  - Precise use of a command vocabulary?
  - How long can older people comfortably talk?

### Attention, Automated Responses and Aging

#### Attention in older adults

- Attention - ability to focus on elements needed for performance of task
- Declines seen with age in :
  - Selective attention - successfully focusing on single task in spite of competing background noise, events, information
  - Divided attention - successfully paying attention to two tasks

#### Automated responses in older adults

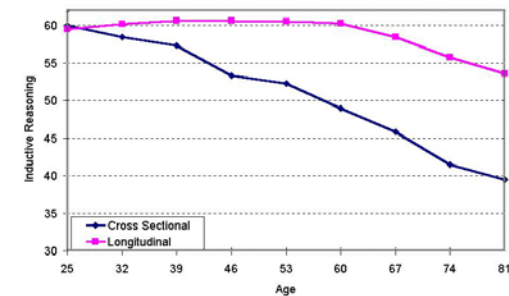
- Automated response - motor or attention responses which do not require cognitive effort
- Allows effortless use of some interface features
- Less likely to be formed by older people?
- Where automated responses exist, older people may find extinguishing them harder?
- Implies behavior first learned in old age continues to take cognitive effort, harder to make applications transparent

#### Attention and automated responses in older people - HCI design issues

- Select graphics carefully for relevance and simplicity
- Avoid distractions - decorative graphics, flashing text, animated graphics, background noise or music
- Multi-media approaches and flamboyant Web pages may disadvantage older users
  - "If it won a design award, older users probably hate it"
- Do not expect older people to automate new behavior
- Watch for problems if older people have to unlearn old responses
- Increase in difficulty on one aspect of application use may show up in poorer performance on other tasks performed at the same time

### Intelligence, Expertise and Aging

Decline in reasoning ability with age



#### Intelligence in older people and HCI Design

- No problems expected on routine tasks
- Problems likely where older people's reduced cognitive reserves are stretched
- E.g. understanding new applications and the more demanding parts of known applications
- Computing expertise may be hard to maintain due to rapid changes in the skills involved
- New interfaces such as ATMs not as easy as the providers expect, especially for the very old
- Of interest to ask :
  - How deeply older users model applications and complex documents?
  - How organised is their approach to understanding new applications?

#### Intelligence and aging - 1

- Individuals largely maintain their intelligence until late 60s - longitudinal studies
- But today's 20 year olds outperform 20 year olds of the past - the Flynn effect - shown in cross sectional studies
- Intelligence tests consist of sub tests of different abilities:- verbal, reasoning, spatial, numeric, etc.
- Typical pattern of individual decline on sub-abilities :
  - Drop on random choice of none, one or two sub-abilities
  - Not uniform overall decline

#### Intelligence and aging - 2

- Crystallised intelligence - reason your way through something the first few times then remember how to do it
  - Contributes to retention of intellectual function in older people
  - Not good for a rapidly changing world

### Intelligence and aging - 3

- Intellectual function and ability to learn
  - Better retained in older adults with high levels of education and job complexity.
  - Nice for academics
- but
  - Equity problems as computer use spreads to whole of older population including less educated people

### Expertise

- Expertise is retained in old age
- But expertise does not prevent general performance declines
- True even in skill areas which might be expected to relate to expertise
- Studies of expertise and aging have involved areas with relatively constant skill sets - chess, typing

### Memory, Learning and Aging

#### Memory in older people

- Multiple types of memory, all decline with age
- Short term memory - items not as securely held
- Working memory - the ability to make use of items in short term memory
  - Central to conscious action
  - Significant decline
  - Poor understanding of complex situations or lengthy text
- Long term memory
  - Recall is best where cues are provided
  - Erratic access - "tip of the tongue" experiences increase
- Declines shown in :
  - Spatial memory
  - Source memory - where was information found
  - Prospective memory - remembering to remember

#### Memory in older people and HCI Design - 1

- Do not overload older people's working memory
- Let users off-load items from short term memory to the program
- Time delays and irrelevant input lead to short term memory losses
- Hence aim for :
  - Simplicity
  - Few distractions
  - Smooth flow of task
  - Minimal memory demands

#### Memory in older people and HCI Design - 2

- Use cues to support recognition of the desired action rather than unassisted recall
  - Labels, menus, captions and grouping by content already do this
  - Icons ?
- Lists rather than paragraphs of text
- Show instructions alongside the context in which they are used - eg. cue tip Help instead of full screen Help
- Give reminders, old users may not "remember to remember",
- "Where did I find that technique?" - source memory problems may affect re-use of complex menus or large Help systems
- What are useful ways of providing "knowledge in the program" to make affordances visible and memorable for older users?

#### Memory in older people and HCI Design - 2

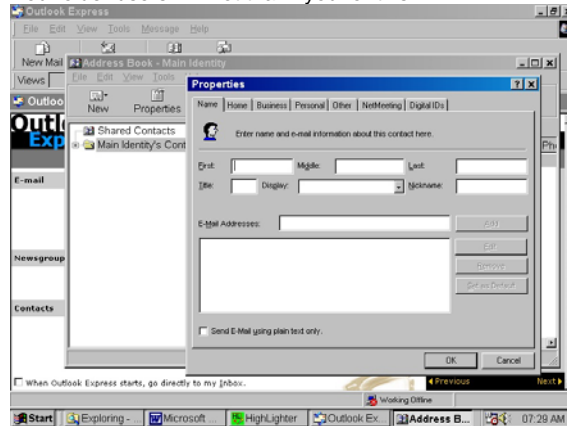
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#### Learning in older people and HCI Design

- Learning slower, harder for older people
- Are older people :
  - More likely to learn a sub-optimal set of skills?
  - Reluctant learners of details they may not use?
  - Less likely to show incidental and one shot learning?
  - More cautious explorers?
  - More likely to give up?
- First exposure to Windows and word processing involves learning a mass of small details, older novices (45 plus) seem less able to cope with this
- Older novices (60 plus) seem slower to master some idioms and to generalise them - eg. scrollbars
- Several studies of training but little agreement
- Could application provide built in strategies for organising learning?

#### Aging and application complexity

Your older users will not thank you for this!



### Dealing with complexity in design for older users

- Avoid it
  - Training
  - Design it out
  - Hide it
  - Step by step guides
  - Delegate it
- Remember - What older users see as complex, younger users and designers are likely to see as trivial

### Complexity - Avoid it

- "No problem is so big that it cannot be run away from" - Charlie Brown in Peanuts
- Modern software houses act as if more features equals better systems
  - Too many features and too much detail put older users off
  - Older users are unlikely to want a full feature set
  - What features be dropped or simplified?
  - [Reduce the number of features](#)
  - There will still be older users who will want greater (or lesser) access to features

### Complexity - Training

- Older people miss out on the "walk up and use it" appeal of much current software

- Self teaching by older users is often ineffective, too many gaps in background knowledge, excessively complex applications and manuals
- Older users can be trained to use complex software
- They take much longer to learn than younger users
- Weeks or months of stress and forgetting
- May never learn to use some features
- They learn well with "training wheels" and "minimal manual" approaches
- Best if the design can have minimal training needs

### Complexity - Design it out

- Are there features that expect users to handle cognitively complex system models or to have a high level of familiarity with operating system idioms?
- If features are dropped or simplified does this provide opportunities to reduce complexity?
- Are older users willing to trade-off "convenience" for simplicity and predictability?
- Example - SeniorMail's full screen windows and simplified navigation model
- Identify the features of mainstream applications that arise from the need to support power users and extensive feature sets, or from assumptions of high levels of user competence, these are candidates for change

### Complexity - Hide it

- There may need to be some more complex options
- Make basic options few and easily available
- Assume that many older users will not use more complex options or may make changes they do not know how to reverse
- Put these more complex options on a chain of option screens where they can be safely ignored
- Windows drop down menus can be difficult for older users - consider toolbars or menu screens
- Keep all but basic options well away from the average older user

### Complexity - Step by step guidance

- Provide guidance for multi-step actions
- Possible that numbered instructions on a single screen are more appropriate than wizards for older people, less need to remember context from previous screens
- Consider using numbered instructions to guide older users

### Complexity - Delegate it

- To the program
  - SeniorMail automatically archives deleted mail and copies of outwards mail after 30 days
  - SeniorMail's Find option searches all lists of stored emails



- But is the program activity adequately modeled and understood by the older users?
- To supporters
  - Can we reduce demands on supporters' time?
  - In SeniorMail; Attachment folders, Categories, IP connection settings and other options are all expected to be done by supporters

**These solutions to complexity do not scale up**

- They all partly depend on simplifying what applications offer
- Hence they do not scale up to fully featured mainstream applications
- I do not believe that there is a way to magically "Seniorize" a mainstream application
- I do not support "Aged rights" at the expense of useful functionality for younger users
- We could still ask young designers to avoid 8 point fonts on patterned backgrounds. There are simple ways to extend the age range for potential users

**Seniormail screen shots**

