The curious case of the jam jar

Dr A Yoxall
The case of the jam jar

Dr J Langley
R Janson
J Wearn
J Luxmoore
Dr R Lewis
E Rodriguez-Falcon
M Austin
Dr R Tomlinson
L Canty
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What is Inclusive Design?

- Design driven by the consumer
  - Know the users
  - Their wants
  - Their needs
What is Inclusive Design?

‘…Design for the young you exclude the old; Design for the old and you include the young…’

– The late Bernard Isaacs, Founding Director of the Birmingham Centre for Applied Gerontology
Why Design Inclusively?

• It makes **good** business sense
  
  • Legislation will prevent discrimination
  
  • Consumers will buy products that work well
Why Design Inclusively?

• It makes **good** business sense
  • Consumers are more likely to complain
  • The general population is getting older
Why Design Inclusively?

• Sadly, despite medical advances your body will enter a stage of decline
• The nature of work is changing
• The nature of society is changing
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Elderly people
People with physical disabilities
Left handed people

50:50 by 2020

- Source: Government Actuary
- Population Projections
Companies are becoming aware

- Some examples:
  - BT Big button phone
  - Ford Focus
  - Oxo Good Grip
Old technophobes find it’s easy to talk on the foolproof mobile

A dumbed-down phone from another era has been a sales success with baffled Japanese, writes Leo Lewis

As the world’s flashiest mobile phone-makers meet in Cannes to show off their latest models, the most sophisticated market for gadgets in the world has fallen in love with a handset that has all the sex appeal of a brick.

The 3GSM World Congress in the South of France is being used to unveil state-of-the-art handsets capable of showing full-length feature films or doubling as an iPod music system.

By contrast, the “S-Phone”, which has attracted thousands of Japanese subscribers since its introduction by the Tu-Ka network last November, has no function except that of a basic telephone. It does not even have a screen.

The S-Phone has been designed to appeal to Japan’s rapidly growing and largely technophobe elderly population. Its buttons are large and perform only one function each. The volume is set high. There are no test messages and definitely just the one ring tone.

The battery is designed so that if the owner forgets to charge it for days on end and fails to use the phone during the intervening time, it will still happily receive a call a month later.

A spokesman for Tu-Ka said that perhaps the most attractive feature of the S-Phone was that, unlike its complicated rivals, it does not come with an instruction manual of intimidating thickness.

The introduction of its dumbed-down phone has reversed a miserable three years for Tu-Ka, and, to universal surprise, propelled the network ahead of Vodafone in the Japanese rankings of subscriber growth. The British company has slipped to last place.

According to figures compiled by Merrill Lynch, Tu-Ka gained 15,500 new users in the month after the S-Phone went on sale while Vodafone gained just 900 in the same month in spite of a pre-Christmas marketing drive on its high-tech 3G services.

Fumie Ochiai, a 68-year-old shopper in Tokyo’s Shinjuku district, said: “My daughter worries about me because I live on my own now. She tried buying me a normal mobile phone but it made so many noises during the night that I turned it off and hid it in a drawer. I find the microwave a bit complicated, but my daughter said that this phone could even be used by idiots.”

A huge advertising campaign for the S-Phone makes a virtue of its total lack of sophistication. In one television advertisement, a baggy-looking grandfather complains to his young relatives that every time he is handed a machine purporting to be simple, it never is. He is passed an S-Phone and is forced to admit that it is absolutely foolproof.

Vodafone has quickly learnt the S-Phone lesson and is planning to introduce its own version in Britain later this year. Vodafone officials said that the Japanese example had clearly demonstrated the market for a handset aimed at the elderly.
Summary

• Inclusive design is in all of our interests otherwise:
  • We will be excluded ourselves
  • It will cost more in taxes
  • Societal issues through exclusion
  • We could be sued
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Companies are becoming aware

• However, there are some bad examples
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What's the worst thing to open?

You said:
1. Tops of bleach bottles
2. Jars
3. Shrink-wrapped cheese and ham and sealed sandwich packets
4. Ring-pull cans
5. Tins of meat/fish

6. Milk cartons and juice cartons (including milk and cream pots for coffee)
7. Child-proof tops on medicines
8. The Cellophane on microwave ready-meals
9. Soap powder boxes
10. Biscuits

99% of young readers think packaging has got more difficult to open in the past ten years.
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I use a screwdriver.....
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I get the gas man to open it for me...
I put a knife under the lid....
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### Packaging Related Accidents

<table>
<thead>
<tr>
<th></th>
<th>1994</th>
<th>1997</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>66,689</td>
<td>63,260</td>
<td>-5.40%</td>
</tr>
<tr>
<td><strong>Major Articles Involved</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Food Cans</td>
<td>13,688</td>
<td>17,248</td>
<td>-7.80%</td>
</tr>
<tr>
<td>Glass Bottles</td>
<td>14,454</td>
<td>12,634</td>
<td>-13.80%</td>
</tr>
<tr>
<td>Compressed Gutters</td>
<td>9,109</td>
<td>5,322</td>
<td>-41.80%</td>
</tr>
<tr>
<td>Kettle Separating Frozen Food</td>
<td>2,383</td>
<td>1,875</td>
<td>-21.70%</td>
</tr>
<tr>
<td>Glass Polishes/Carasate</td>
<td>2,083</td>
<td>1,837</td>
<td>-12.30%</td>
</tr>
<tr>
<td>Kettle opening Packaging</td>
<td>1,988</td>
<td>1,774</td>
<td>-11.30%</td>
</tr>
<tr>
<td>Obstinate</td>
<td>1,904</td>
<td>1,104</td>
<td>-41.20%</td>
</tr>
<tr>
<td>Turpentine/White Spirit</td>
<td>1,593</td>
<td>1,261</td>
<td>-21.40%</td>
</tr>
<tr>
<td>Perfumes</td>
<td>1,269</td>
<td>1,590</td>
<td>+11.70%</td>
</tr>
<tr>
<td>Bleach</td>
<td>1,822</td>
<td>1,875</td>
<td>+3.00%</td>
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<tr>
<td>Other Unsaturated Solvents</td>
<td>1,137</td>
<td>1,490</td>
<td>+29.60%</td>
</tr>
<tr>
<td>Other</td>
<td>1,137</td>
<td>1,331</td>
<td>+16.30%</td>
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</tbody>
</table>

**Age of Victim**

<table>
<thead>
<tr>
<th></th>
<th>1994</th>
<th>1997</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1</td>
<td>1,319</td>
<td>922</td>
<td>-30.30%</td>
</tr>
<tr>
<td>1 to 4</td>
<td>16,046</td>
<td>19,830</td>
<td>-23.60%</td>
</tr>
<tr>
<td>5 to 9</td>
<td>9,736</td>
<td>9,140</td>
<td>-6.20%</td>
</tr>
<tr>
<td>10 to 14</td>
<td>10,680</td>
<td>8,606</td>
<td>-19.80%</td>
</tr>
<tr>
<td>15 to 19</td>
<td>8,365</td>
<td>9,045</td>
<td>+8.50%</td>
</tr>
<tr>
<td>20 to 24</td>
<td>9,420</td>
<td>9,320</td>
<td>-1.00%</td>
</tr>
<tr>
<td>25 to 29</td>
<td>4,011</td>
<td>4,095</td>
<td>+2.10%</td>
</tr>
<tr>
<td>30 to 34</td>
<td>2,011</td>
<td>2,900</td>
<td>+44.40%</td>
</tr>
<tr>
<td>35 to 39</td>
<td>1,139</td>
<td>2,109</td>
<td>+86.30%</td>
</tr>
<tr>
<td>40 to 44</td>
<td>1,085</td>
<td>1,888</td>
<td>+73.70%</td>
</tr>
<tr>
<td>Age Not Known</td>
<td>284</td>
<td>102</td>
<td>-64.10%</td>
</tr>
</tbody>
</table>

**Gender**

<table>
<thead>
<tr>
<th></th>
<th>1994</th>
<th>1997</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34,687</td>
<td>34,465</td>
<td>-0.40%</td>
</tr>
<tr>
<td>Female</td>
<td>32,002</td>
<td>28,795</td>
<td>-9.90%</td>
</tr>
</tbody>
</table>

- Source: Metra Martech
Current Research Projects

- Optimum closure width
- Openability of flexible packaging
- Measuring human ability and openability
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**Methodology**

- 3 stranded approach
  - Developed by Engineered Packaging Group

- Experimental Analysis
- Redesign
- Analytical Analysis
- Numerical Analysis
• Use of analytical equations to understand function of pack design

• Develop experimental and numerical methods to measure pack properties

• Integrate with understanding of human ability
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Numerical Analysis

• Build CAD models of system
  - how the pieces fit together
• Build finite element models
  - the forces in the system
  - how the pieces deform
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\[ T = F r \]

\[ T = N_A \mu_{SHC} r_{external} \]

\[ T = (C \mu_{GL} + \mu_{GC} \cos \theta[N_A + N_T] - N_T \cos \phi \sin \theta + A \sigma_{FLOW} \mu_{GC})r_{internal} \]
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**Experimental Analysis**

- Jar opening torque measurement
  - torque required for opening
- Human grip strength testing
  - grip force for various diameter lids
- Human opening torque testing
  - accurately measure true opening force
- Material properties
  - friction coefficients, tensile strength, etc
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Apparatus

- Need to design equipment to accurately measure the force a user can apply to a jar.
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Designing the test

• Tests as realistic as possible

• Test mimics actual opening task
  – Use of table/chair
  – Any grip/posture
  – Multiple attempts

• Test people of all ages/abilities

• Instructed to stop if they felt pain or discomfort
  – Maximum *comfortable* appliable torque
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Results

• 235 people tested over 4 months
  – 97 Female
  – 138 Male
• Wide ranges of ages tested
  – 8→95 years
• Even spread of subjects across age range
• Discussed packaging experience during the test
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Results

- Jar + 1 s.d.
- Jar Mean
- Jar - 1 s.d.
- Male Mean
- Male - 1 s.d.
- Female Mean
- Female - 1 s.d.

Applicable Torque (Nm)

Age (Years)
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Validation

‘Yours’ Magazine (2,000 subjects)

- 70% ‘abandoned a product’
- 91% needed assistance

Opinions from subjects

- Females of all ages complain of problems
- Some elderly women avoid food in jars
- Few men under 70 reported problems
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- Appliable torque depends on materials and geometry
  - Testing on actual components required
  - Previous data not representative
- New test data more comparable to actual opening
  - Realistic opening situation
  - Actual materials/geometry
• SPARC funding enabling us to increase the rate of testing

• SPARC funding enabling us to increase the speed of data manipulation

• We want to test approximately 3000 people by the Summer 2006
Conclusions

• We are starting to understand the factors that affect opening.

• This can be matched to the ability of the least able.

• Both manufacturers and consumers benefit.
‘An inclusively designed product should only exclude the users that the product requirements exclude’

- Keates, Clarkson
Thank you

The University of Sheffield
Department of Mechanical Engineering
Engineered Packaging Research Group

engineeredpackaging@sheffield.ac.uk
www.shef.ac.uk/mecheng/epas
+44 114 2227734