Old People at Home with Acquired Cognitive Impairment Supported by Assistive Technology – Cost and Benefit Studies

Ulf KEIJER and Greger SANDSTRÖM

The Architectural School
Royal Institute of Technology
Stockholm, Sweden
ulf.keijer@arch.kth.se, greger.sandstrom@jm.se
The presentation

• About the project “At Home with IT”
• The PENG cost-benefit model – an experimental undertaking

• Benefit – Benefit of the individual
• Benefit in monetary terms
• The process and modifications of the model
• Benefits and costs
• Conclusions
The “At-Home-with-IT” Project

• People with cognitive disorder living in their own homes
• Real-life studies in three Swedish municipalities
• 10-20 individuals (most 60 or older) at each site
• AT and installations in the homes to meet individual needs
• Co-operation between municipal care and house owners
• Expected outcome: “Tool-box” of recommended technology and procedures
Examples of installed AT and equipment

• Memory aids (day planner, day-date clock, away key)
• Safety measures (stove guard, away lock, picture door phone)
• Communication facilitators (picture phone)
• Trouble solvers (locators, adapted TV controller)
Examples of installed AT and equipment

- Adapted TV controller
- Picture door phone
- Picture phone
- Day planner
- Magnetic valve (locked by Away lock)
- Balcony lock (locked by Away lock)
The PENG Model

• Developed for estimation of cost vs. benefit of investment in IT systems for regular organisations (business, government, health care, etc.)

• Fast track procedure – with expertise from relevant parties of the organisation (sometimes also customers)

• IT for the benefit of own organisation – not for the customers

• Three or four half-day sessions – 6-10 experts and a monitor
The PENG Model – Benefit and cost in monetary terms

- Benefit difficult to estimate
- Indirect benefit
- Direct benefit
- Cost for benefit

Maximum gain of investment

Positive direct benefit
PENG project work group members

• Occupational therapist, practitioner
• Physical therapist, local municipality
• Representative from municipal housing adaptation
• Manager, elderly care, local municipality
• Co-ordinator, elderly issues, housing company
• AT expert, consultant
• End-user group representative
• Two monitors, university (KTH)
Preparation measures

Modifications of the PENG regular model in order to form a common platform for the work group

• Standardised personal profiles defined
  - Gunnar, 81, widower
  - Iréné, 63, married (profile was not applied)

• Description of eleven AT devices to be considered

• Description of supporting functions of the technology

• Cost of ordinary daily life activities
Gunnar’s assumed personal profile

- **Social situation** (widower, 3 children in neighbourhood, previously active in local congregation)
- **Health status/diseases** (generally good health during life, angina pectoris, 3 heart attacks, right leg pain and weakness induces falling, hearing and vision impairment, depression after wife’s death)
- **Medication** (several pills twice a day)
- **Personal activities** (early riser, washing, shaving dressing of his own, eats but no cooking, help with shower, reads papers and watches TV, help with purchase of food and clothes, and with visits to relatives, church, etc.)
- **Flat** (3 pieces, balcony, security door, safety alarm)
- **Current assistive technology** (stick, magnifying glass, hearing aid)
Proposed measures for Gunnar

- Proposed adaptations in the flat
  - stove guard
  - motor lock at balcony door
  - away lock
  - away key
  - picture door phone

- Proposed assistive technology
  - door speaker
  - bed alarm
  - guiding floor light
  - locator
  - care call
  - adapted TV controller
  - medication reminder
  - picture phones
Session activities and work group decisions

a) demonstration of proposed assistive technology

b) the common task lying ahead was discussed thoroughly

c) the PENG model and its purpose was described and made understood

d) target beneficiaries were decided (end-users, relatives, house owner, care providers, local community)

e) what is end-user benefit? The group made up its mind:
   - quality of life
   - self esteem (by augmented independence)
   - safety (the feeling of)
   - security (the objective fact)

f) benefits were also defined for relatives, carers, etc.

g) common assessment of every day costs was listed
### Every day services – Reference costs

<table>
<thead>
<tr>
<th>Service and cost (1 € = 10 SEK)</th>
<th>€ per day</th>
<th>€ per month</th>
<th>€ per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinay lunch at a restaurant in Stockholm</td>
<td>6,50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public transport (in Stockholm wider area)</td>
<td>1,20</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Alarm package (detached house)</td>
<td>0,85</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Broadband subscription</td>
<td>0,80</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Cable TV subscription</td>
<td>0,65</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>TV license (public service)</td>
<td>0,60</td>
<td></td>
<td>198</td>
</tr>
<tr>
<td>Daily newspaper (subscription)</td>
<td>0,50</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Cinema ticket</td>
<td>0,30</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Train trip 70 km (return ticket)</td>
<td>0,40</td>
<td>13 (per trip)</td>
<td></td>
</tr>
<tr>
<td>Fixed phone connection subscription</td>
<td>0,50</td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>Municipality home service (prescription)</td>
<td>2,00-5,00</td>
<td>~ 1600</td>
<td></td>
</tr>
<tr>
<td>Transportation service (prescription)</td>
<td>1,00</td>
<td>~ 300</td>
<td></td>
</tr>
<tr>
<td>Medication</td>
<td>0,60</td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>Medicare</td>
<td>0,30</td>
<td></td>
<td>90</td>
</tr>
</tbody>
</table>
Work sheet (section)

Requires

1. Increased benefit to the user
   1.1 Increased quality of life
      1.1.1 Allows the user to stay (longer) in her home
      1.1.2 Allows the user to keep her social network
      1.1.3 Other
   1.2 Increased self-esteem through independence
      1.2.1 Stimulating to activities
      1.2.2 "Good not to become a burden to some other"
      1.2.3 Making it possible for the user to leave home
      1.2.4 Allows the user to make a phone call all by herself
      1.2.5 Easy to find desired TV channel
      1.2.6 Other

Implies

1.1.1 Keep her own furniture, rugs, decoration
   1.1.1.1 Keep her own furniture, rugs, decoration
   1.1.1.2 No break-up from familiar surroundings
   1.1.2 Keep her own social network
   1.1.2.1 Allows the user to stay (longer) in her home
   1.1.2.2 Allows the user to keep her social network
   1.1.2.3 Other
   1.2.1 Keep her own independence
   1.2.1.1 Stimulating to activities
   1.2.1.2 "Good not to become a burden to some other"
   1.2.1.3 Making it possible for the user to leave home
   1.2.1.4 Allows the user to make a phone call all by herself
   1.2.1.5 Easy to find desired TV channel
   1.2.1.6 Other

Additional features:
- Door teller
- Away lock
- Picturephone
- Carecall
- Picture door phone
- Locators
- Movement controlled guiding floor light
- Medication reminder
- Door teller
- Away lock
- Away key
- Carecall
- Picturephone
- Carecall
- Adapted TV controls
- Increased benefits
1. Increased benefit to the user

1.3 Increased safety

1.3.1 Memory support

1.3.2 Making it easy to trace the user if she cannot find her way home

1.3.3 Other

1.4 Increased security

1.4.1 Diminished risk for attack/robbery

1.4.2 More easy to identify a visitor before letting him in

1.4.3 Diminished risk for fire at home

1.4.4 A possibility for the user to make a call if she cannot find her way home

1.4.5 Diminished risk for stumbling or falling

1.4.6 Other

Requires

Implies

- Medication reminder
- Away key
- Door teller
- Carecall
- Picture door phone
- Away lock
- Carecall
- Movement controlled guiding floor light
- Door speaker
Well-being in monetary terms
(benefit per day)

<table>
<thead>
<tr>
<th>AT Device</th>
<th>Quality of life</th>
<th>Independence</th>
<th>Safety</th>
<th>Security</th>
<th>Increased safety</th>
<th>Time saved</th>
<th>Less problems with user</th>
<th>Landlord benefit</th>
<th>Care provider benefit</th>
<th>Benefit in neighborhood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapted TV controller</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture door phone</td>
<td>0.13</td>
<td>0.15</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td>0.25</td>
<td>0.02</td>
<td>0.15</td>
</tr>
<tr>
<td>Away lock</td>
<td>0.25</td>
<td>0.20</td>
<td>0.15</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td>0.40</td>
<td>0.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Away key</td>
<td>0.30</td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.30</td>
<td>0.35</td>
</tr>
<tr>
<td>Carecall</td>
<td>0.50</td>
<td>0.50</td>
<td>0.15</td>
<td>0.50</td>
<td>0.50</td>
<td>0.30</td>
<td></td>
<td></td>
<td>0.13</td>
<td>0.50</td>
</tr>
<tr>
<td>Door teller</td>
<td>0.05</td>
<td>0.20</td>
<td>0.15</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>0.20</td>
</tr>
<tr>
<td>Locators</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
<td>0.13</td>
</tr>
<tr>
<td>Medication reminder</td>
<td>0.05</td>
<td>0.10</td>
<td>0.05</td>
<td>0.10</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td>0.04</td>
<td>0.35</td>
</tr>
<tr>
<td>Picture phone</td>
<td>0.05</td>
<td>0.05</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td>0.15</td>
</tr>
<tr>
<td>Floor light</td>
<td>0.40</td>
<td>0.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.07</td>
<td>0.55</td>
</tr>
<tr>
<td>Bed alarm</td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Beneficairies: 1. The user 2. Relatives/friends 3. Others

Well-being in monetary terms (benefit per day)
Cost reduction (monetary terms)
(cost reduction per day)

<table>
<thead>
<tr>
<th>For whom:</th>
<th>1. The user</th>
<th>2. Relatives/friends</th>
<th>3. Others</th>
<th>Ave.</th>
<th>High value</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A T Device</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less falling</td>
<td>1.1</td>
<td>1.2</td>
<td>1.3</td>
<td>2.1</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Less anxiety</td>
<td></td>
<td></td>
<td>Control of outgoing</td>
<td>Lower insurance</td>
<td>Less anxiety and stress</td>
<td>Landlord cost reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapted TV controller</td>
<td></td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door phone</td>
<td>0.20</td>
<td>0.10</td>
<td>0.20</td>
<td>.10</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Away lock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Away key</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carecall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door teller</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
<td>0.05</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Locators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication reminder</td>
<td></td>
<td>0.20</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picturephone</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor light</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed alarm</td>
<td></td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Investment cost and time for pay-back

<table>
<thead>
<tr>
<th>A T device</th>
<th>Investment (€)</th>
<th>Comment</th>
<th>Days for pay-back</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapted TV controller</td>
<td>68</td>
<td>Easily programmable</td>
<td>247</td>
</tr>
<tr>
<td>Picture door phone</td>
<td>975</td>
<td>Incl. installation cost</td>
<td>1048</td>
</tr>
<tr>
<td>Away lock</td>
<td>1.197</td>
<td>Incl. installation cost</td>
<td>725</td>
</tr>
<tr>
<td>Away key</td>
<td>269</td>
<td>Excl. development cost</td>
<td>316</td>
</tr>
<tr>
<td>Care call</td>
<td>531</td>
<td></td>
<td>183</td>
</tr>
<tr>
<td>Door teller</td>
<td>312</td>
<td></td>
<td>223</td>
</tr>
<tr>
<td>Locators</td>
<td>54</td>
<td></td>
<td>193</td>
</tr>
<tr>
<td>Medication reminder</td>
<td>75</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Picture phone</td>
<td>30</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Floor guiding lights</td>
<td>~200</td>
<td>Reflecting tape better</td>
<td>146</td>
</tr>
<tr>
<td>Bed alarm</td>
<td>~2000</td>
<td>Connected to carer</td>
<td>2118</td>
</tr>
</tbody>
</table>
Conclusions

• The applied method leads eventually to figures which could serve as a basis for decision-making in a particularly soft scientific and practical environment

• This is a first attempt only, more practice of the method is required, with different sets of professionals

• The outcome of the method should be scrutinised and verified against different types of user benefit studies (observation of test persons, control groups, etc.)
Thank you for your attention