Hearing Industry Perspectives for EU funded Hearing Research in Europe

Nikolai Bisgaard
VP IPR & Industry Relations
GN ReSound as
Denmark
The Hearing Aid Industry in Europe

• 5 out of 6 major hearing aid manufacturer are in Europe
  • **GN ReSound (DK)** - ReSound, Beltone, Interton
  • **Siemens (D)** – Siemens, Rexton, AudioService
  • **Sonova (CH)** – Phonak, Unitron
  • **Widex (DK)** – Widex
  • **William Demant (DK)** – Oticon, Bernafon
  • Several minor players – mostly local

• 1 other significant hearing aid manufacturer
  Starkey is in the USA

• Strong research is a key factor for keeping the industry in Europe
Hearing Industry & Research

- **Total annual revenues:** (est.) €3,000 mill.
- **Typical R&D spending:** (% of Revenues) 7%

- **Total industry R&D budget:** €210 mill.
  - Only a smaller fraction of the R&D expenses is for basic research
  - Most is used for product development
    - Chip sets
    - Algorithm & Software
    - Mechanical systems

- **More effort is needed in basic research**
Research areas

**Hearing Industry Specific**
- Auditory research
  - Basic psychoacoustics
  - Hearing impairment
  - Audiology/diagnostics
  - Linguistics
- Acoustics
  - Electro-acoustics
  - Transducers
- Signal Processing
  - Audibility restoration
  - SpeechNR improvement
  - Environmental adaptation
- User profiling
  - Psychology

**Driven by other industries**
- Low power DSP
  - Converters
  - DSP cores
- Materials
  - Plastics
  - Structural analysis
- Wireless connectivity
  - Low power RF
  - Data reduction and encoding
- Power Supplies
  - Rechargable batteries
Technology continues to develop

- Digital hearing aids are made today using the same technology as most other consumer electronics
- Moores law will secure more and better signal processing
- More new products with shorter intervals
What is the status for hearing aids in general?

- Hearing aids as we know them have evolved and improved over the last 50-60 years

- The number of users has grown very considerably over that period

- But hearing aids are still only used by a fraction of those who could benefit

- Stigma is an often used explanation for non-use

- Performance can still be improved
Hearing Aids help – how many have them?

• Coverage varies greatly across the world, but only limited data is available:
  • Total sales of hearing aids per country per year
  • Basic demographics

• In order to calculate coverage assumptions must be made and more factors must taking in to account:
  • The fraction of bilateral fittings
  • The average lifetime of a hearing aid

• Coverage could be affected by factors such as:
  • Standard of living
  • Subsidies
Approx 8.5 mill. hearing aids sold in 2007

North America
2.5 million units

Europe
3.0 million units

APAC
1.6 million units

Rest of World
1.4 million units
## Hearing Aid coverage across the world

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Population</th>
<th>Population over age 18</th>
<th>Impaired Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>21,0</td>
<td>13,6</td>
<td>2,2</td>
</tr>
<tr>
<td>USA</td>
<td>304,0</td>
<td>194,3</td>
<td>30,9</td>
</tr>
<tr>
<td>Europe</td>
<td>507,6</td>
<td>394,4</td>
<td>62,7</td>
</tr>
<tr>
<td>Japan</td>
<td>127,0</td>
<td>78,4</td>
<td>12,5</td>
</tr>
<tr>
<td>Russia</td>
<td>141,0</td>
<td>94,4</td>
<td>15,0</td>
</tr>
<tr>
<td>China</td>
<td>1,330,0</td>
<td>906,0</td>
<td>144,1</td>
</tr>
<tr>
<td>India</td>
<td>1,148,0</td>
<td>682,2</td>
<td>108,5</td>
</tr>
<tr>
<td>Total</td>
<td><strong>3,578,6</strong></td>
<td><strong>2,363,3</strong></td>
<td><strong>375,8</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HA</td>
<td>Bil</td>
<td>PF</td>
<td>HAU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>320</td>
<td>50%</td>
<td>213</td>
<td>853</td>
<td>39%</td>
<td>37.300</td>
<td>4</td>
</tr>
<tr>
<td>USA</td>
<td>2,425</td>
<td>80%</td>
<td>1,347</td>
<td>5,389</td>
<td>17%</td>
<td>45.800</td>
<td>2</td>
</tr>
<tr>
<td>Europe</td>
<td>3,657</td>
<td>50%</td>
<td>2,441</td>
<td>9,765</td>
<td>16%</td>
<td>30.382</td>
<td>2</td>
</tr>
<tr>
<td>Japan</td>
<td>450</td>
<td>20%</td>
<td>375</td>
<td>1,500</td>
<td>12%</td>
<td>33.500</td>
<td>2</td>
</tr>
<tr>
<td>Russia</td>
<td>225</td>
<td>10%</td>
<td>205</td>
<td>818</td>
<td>5%</td>
<td>14.800</td>
<td>1</td>
</tr>
<tr>
<td>China</td>
<td>430</td>
<td>7%</td>
<td>402</td>
<td>1,607</td>
<td>1%</td>
<td>5.400</td>
<td>1</td>
</tr>
<tr>
<td>India</td>
<td>250</td>
<td>7%</td>
<td>234</td>
<td>935</td>
<td>1%</td>
<td>2.600</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td><strong>7,757,0</strong></td>
<td><strong>65%</strong></td>
<td><strong>5,003,6</strong></td>
<td><strong>20,014,2</strong></td>
<td><strong>5%</strong></td>
<td><strong>8.307</strong></td>
<td></td>
</tr>
</tbody>
</table>
World market overview

Percentage of Impaired Population with Hearing Aids

- Australia: 45%
- USA: 15%
- Europe: 10%
- Japan: 5%
- Russia: 0%
- China: 0%
- India: 0%
Major Regional differences in Europe

Hearing Instrument Coverage

Percentage of impaired population

Denmark, UK, Norway, Netherlands, Sweden, Germany, Switzerland, France, Austria, Finland, Italy, Belgium, Estonia, Spain, Slovakia, Ireland, Czech Rep, Hungary, Slovenia, Portugal, Poland, Latvia, Greece, Lithuania
GDP - a strong driver for differences

- Gross Domestic Product (GDP) per capita correlates quite well with coverage for many countries.
Subsidies also drive coverage
Case Story: Denmark

- A combination of several factors led to increased coverage in Denmark after 2001
  - Voucher for fitting in private shop instead of hospital clinic
    (Attractive business model) & (More accessible outlets)
  - Coverage rose from 27% to 40%
  - Resulted in shortage of educated staff

![Graph showing total HA sold 2000-2008 and split between public and private.]
Case story: US market

- The US market has for decades been divided between custom made In-the-Ear (ITE) products (80 %) and factory made Behind-the-Ear (BTE) (20 %)
- Comfortable and small instant fit BTE’s has changed the game and increased BTE usage, but
- Not significant growth in coverage

Data source: HIA statistics
Why is more research needed?

- Still less than 60% of people with significant hearing loss are using hearing aids.
  - What does it take to increase coverage?

- For many years signal processing capacity available in hearing aids was quite limited
  - Today we have 10-15 DSP MIPS at our disposal
  - What should they be used for?

- The field of diagnostics was developed primarily from a medical perspective with focus on thresholds

- For hearing aid fitting we need detailed characterisation of super-threshold performance in several aspects as described in the Auditory profile

- New diagnostic procedures must provide value for the hearing aid fitting professionals
What further research is needed?

- Auditory profiling is an important step towards solutions that are not only customised physically, but also truly customized from a signal processing viewpoint. More effort is needed to develop:
  - Time-efficient diagnostic procedures
  - Mapping of signal processing needs for identified groups

- Spatial hearing seems to be an important component in coping with competing noise. More effort could be used in defining:
  - Realistic spatial test scenarios
  - Spatial benefit testing for clinical use

- Public services to support hearing aid coverage
  - Wireless services
  - Internet information and self-testing
CEN 380 European standard project

• A recent effort to create a standard for: “Services offered by Hearing Aid professionals”

• In Europe the situation between member states differs significantly from no national regulations to very organized and sophisticated systems

• If adopted the standard will set forth requirements for the following areas:
  • Education
  • Facilities
  • Equipment
  • Fitting process
  • Quality management system

• The scope is all typical age related losses acknowledging that children, cochlear implants and multiple handicaps require further efforts