Emerging Technologies Panel

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Bob Yeager & NSF

Jim Lenker
Overview

• Assistive Technology

• Historical Framework

• Development in Public & Private Sectors
Assistive Technology

Technology-Related Assistance For Individuals With Disabilities Act Section 3. Definitions. (2)

“The term “assistive technology device” means any item, piece of equipment, or product system, acquired commercially off the shelf, modified, or customized, used to increase, maintain, or improve functional capabilities of individuals with disabilities.”

World Health Organization

International Classification of Functioning, Disability and Health (ICF)

Technical Aids for Persons with Disabilities: Classification and Terminology (ISO 9999)
# ICF-Based Taxonomy

<table>
<thead>
<tr>
<th>ICF Component</th>
<th>Integration</th>
<th>Customization</th>
<th>Role(s)</th>
<th>Context(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Structure &amp; Function</strong></td>
<td>Intrinsic</td>
<td>Custom</td>
<td>Pervasive</td>
<td>Pervasive</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>Extrinsic</td>
<td>Configured</td>
<td>Pervasive</td>
<td>Pervasive</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>Environmental</td>
<td>Group</td>
<td>Situational</td>
<td>Situational</td>
</tr>
<tr>
<td><strong>Contextual</strong></td>
<td>Societal</td>
<td>Cross-Group (Universal)</td>
<td>Facilitator</td>
<td>Facilitator</td>
</tr>
</tbody>
</table>
AT for Body Function & Structure

✓ Intrinsic
✓ Custom
✓ Pervasive (across) Roles
✓ Pervasive (across) Contexts
Cognitive Prosthesis

Sensory Prosthesis

NMS Prosthesis

Nerve Stem Cells, Nerve Growth Factors, Hydrogels…

Nanotube & Polymer Scaffolds (Implants)
AT for Activities

Low Vision

✓ Extrinsic

✓ Configurable
✓ Pervasive Roles
✓ Pervasive Contexts

Blind Wayfinding
Another TESLA Patent!
AT for Participation

- **Computer Interfaces**
- **Environmental**
- **Group**
- **Situational Roles**
- **Situational Contexts**

- **Wireless Integration**

- **UD Learning**

- **Wireless Integration**

- **Cognitive Assistants**
  - Environmental Control
  - Communication
  - Wayfinding
  - Hearing…
Contextual AT

“Use the ADAPTIVE DEVICE LOCATOR SYSTEM-on-the-Web to find information about assistive technology products from thousands of companies to make life better and help you live independently.”

“Authoring Tool that Promotes Web Accessibility”

Academic Software Inc.
adaptworld.com

☑ Societal
☑ Cross-Group
☑ Facilitate (across) Roles
☑ Facilitate (across) Contexts

KPR Koester Performance Research

Compass - Access Assessment Software

Information Technology Solutions

MSF&W
History

• Disability Rights, Independent Living Movement
• Societal Paradigm Shift
  • Legislation, Rules, Guidelines, Legal Challenges
• Customers, Markets
• Professions, Industries
Legislation By “Type”

• Demand
  + Market Size
  + $ in Market
  + Requirements on Purchase
  + Requirements on Function

• Supply
  + Product Development
  + Applied Research
  + Basic Research
  + Capacity Building

• Demand Impact >> Supply Impact
Demand Legislation 🐇

- Section 508 of the Rehabilitation Act as Amended (1998)
  - Electronic and Information Technology
  - Accessible to Federal Employees, Persons Using Federal EIT

- Federal Acquisition Regulations (2001)
  - Computers, PDA, kiosks, websites…
  - Department of Defense, General Services Administration, National Aeronautics and Space Administration
  - Economic Impact >$100M/Yr (Major Ruling)
  - Exceptions: Micro-Purchase, National Security… Undue Burden

[http://www.access-board.gov/sec508/FARnotice.htm](http://www.access-board.gov/sec508/FARnotice.htm)
Demand Legislation

• (1973) Rehabilitation Act
• (1988) Hearing Aid Compatibility Act
• (1990) Americans with Disabilities Act
• (1990) Air Carrier Access Act
• (1996) Section 255 of Telecommunications Act
• (1997) Individuals with Disabilities in Education Act
  – Title II (Assistance to States for Education of Children with Disabilities)
  – National Instructional Materials Accessibility Standard
• (2007) Hearing Aid Tax Credit legislation
Demand Legislation 🌸

• Americans with Disabilities Act (1990)
  – Title II (State and Local Governments) - "...required to give people with disabilities an equal opportunity to benefit from all their programs, services and activities (e.g. public education, employment, transportation, recreation, health care, social services, courts, voting and town meetings)...",

• Olmstead Decision (1998), Olmstead Executive Order (2001)
  – Supreme Court …ruled that Title II of the Americans with Disabilities Act requires that people with cognitive disabilities (and by extension any person with a disability) must be able to live in a "least restrictive environment."

• Disabled Elders, Elder Demographics…
Elder AT and UDT

- Intel+ – Smart Homes, Telehealth, Telerehab
- Microsoft+ – Computer Access
- Whirlpool+ – Major Home Appliances
- Black and Decker – Kitchen Appliances
Supply Legislation

• (1980) Stevenson-Wydler Technology Innovation Act
  – Federal Labs

• (1980) Bayh-Dole Patent and Trademark Act
  – Universities

• (1982) Small Business Innovation Development Act
  – Small Business

• (1992) Small Business Technology Transfer Act
  – Small Business + Universities
Supply Legislation

Title 15 - Commerce and Trade (Stevenson-Wydler Technology Innovation Act) §3710 Utilization of Federal Technology (e)(1)(K)

“…work with the Director of the National Institute on Disability and Rehabilitation Research (NIDRR) compile a compendium of current and projected Federal laboratory technologies and projects intended or recognized impact on the available range of assistive technology for individuals with disabilities, including technologies and projects that incorporate the principles of universal design.”
AT SBIR Awards (1996-2005)

Phase I
- Transportation: 48
- Agriculture: 6
- NSF: 5
- Education: 194
- NIH: 384
- Total: 60.3%

Phase II
- Transportation: 19
- Agriculture: 5
- NSF: 4
- Education: 79
- NIH: 231
- Total: 68.3%

DoED : NIH ~ 1 : 70
AT SBIR Funding (1996-2005)
Amount per Award

SBIR Awards (1996-2005)

<table>
<thead>
<tr>
<th>Category</th>
<th>Phase II</th>
<th>Phase I</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIH</td>
<td>716</td>
<td>114</td>
</tr>
<tr>
<td>Education</td>
<td>316</td>
<td>63</td>
</tr>
<tr>
<td>NSF</td>
<td>580</td>
<td>105</td>
</tr>
<tr>
<td>Agriculture</td>
<td>254</td>
<td>70</td>
</tr>
<tr>
<td>Transportation</td>
<td>383</td>
<td>100</td>
</tr>
</tbody>
</table>
AT for Function & Structure

SBIR Awards (1996-2005)

Number of Awards

Phase I
- Skin: 17
- Sensory: 1
- Neuro-Muscular-Skeletal: 39
- Genito-Urinary: 10
- Communication: 4

Phase II
- Neuro-Muscular-Skeletal: 18
- Cardio-Vascular-Respiratory: 13
- Communication: 2

Legend:
- Skin
- Sensory
- Neuro-Muscular-Skeletal
- Genito-Urinary
- Digestive-Endocrine
- Communication
- Cardio-Vascular-Respiratory
E.g. SBIR Awards: AT for Activities

![Bar chart showing the number of awards in Phase I and Phase II for different categories: Computer Access, Cognitive, Communication, Wayfinding, Blindness, Vision, Deafness, Hearing, Prosthesis, and Mobility]
AT for Participation

Number of Awards

Phase I  Phase II

Recreation  Health  Independent Living  Training  Computer Access  Cognitive  Communication  Wayfinding  Blindness  Vision  Deafness  Hearing  Prosthesis  Mobility
E.g. Federal Programs

- (NIDRR) Rehabilitation Engineering Research Centers
- (NIH) National Center for Medical Rehabilitation Research
- (NSF) Research to Aid Persons with Disabilities

**RAPD Awards (1996-2005)**

- Function & Structure
- Activities
- Participation
- Capacity Building
- Basic Research
Questions?
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