Universal Design and Assistive Technology
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The Centre for Excellence in Universal Design

Neil Murphy MRlAI
Senior Built Environment Advisor, CEUD

James Hubbard
Senior Design Advisor Products & Services
CEUD
OXO – Good Design Enables

Universal Design
Universal Design in Ireland

Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability.

(Synthesis of the Irish Disability Act 2005)

An approach to promoting more accessibility and usability in Built environment, Products, Services and ICT systems.

Centre for Excellence in Universal Design, CEUD
Established January, 2007 in the NDA
Aims of the Centre for Excellence in Universal Design (CEUD)

Standards
- Stimulate research
- Participate in Standardisation work nationally and internationally
- Provide advice to stakeholders
- Encourage compliance

Education and Professional Development
- Incorporation into design curriculum
- Application of Universal Design for Learning approach to teaching and examinations

Awareness
- Best practice database
- Promote awareness and understanding
MEDION® LIFE® MD 82940 is a DECT-standard speaker phone. The premium loudspeakers used for the handset and the base station provide for extraordinary audio quality, enabling even those people with hearing difficulties to use the phone. A broad range of functions & low power consumption are additional features.

Multifunctional and compact like a mini-lamp LED lightbulb small lamp type (standard) The new LED lamp is as compact as a mini-lamp and suitable for many different uses. With a service life estimated at 40,000 hours, it needs to be changed only about every ten years. The lamp’s simple shape does not attract dust and makes cleaning easy.

Color Adjuster

Help for color-blind PC users Product — Color Adjuster System for Application Software The system is able to correct any display color and the background of the screen to enable color-blind users to easily read the information displayed. The software takes into account the world’s leading web contents and user guidelines. Text, buttons, trims and backgrounds are the four main elements that can be adjusted on a screen interface.

Universal Design
CEUD - Information Communication Technology (ICT)

6 technology areas

• Web
• Public access terminals
• Application Software
• Telecoms
• Smart Card Systems
• Digital TV Switch
Built environment
Products & Services
ICT

Universal Design
Functional Capacity across age and the Disability Threshold (WHO-ICF)

Figure 4. Maintaining functional capacity over the life course

Source: Kalache & Kickbusch (12).
Research Study on Assistive Technology in Ireland (2011)

- **Objectives**
  - map the system(s) of AT provision in Ireland
  - identify good practice from other countries
  - prepare guidance for further development of the Irish system

- AT service delivery systems in **3 settings**
  - home / community / everyday life
  - employment
  - education

- **Other countries** covered
  
  Denmark 🇩🇰  Italy 🇮🇹  Netherlands 🇳🇱  Norway 🇳🇴  UK 🇬🇧  Germany 🇩🇪
$\textbf{Mobility}$
- Grab rails and bars
- Powered wheelchair
- Manual specialised wheelchair
- Adapted vehicles (wheelchair rack for car, gears/lifts)

$\textbf{Orthotics & prosthetics}$
- Lower limb orthoses
- Orthopaedic footwear (e.g. built up shoe)
- Upper limb orthoses

$\textbf{Vision}$
- Special computer equipment
- Audible tactile devices (e.g. talking scales, clocks)
- Print/display magnification
- Magnifiers

$\textbf{Hearing}$
- Alerting devices
- Hearing aid (incl. cochlear implant/digital hearing aid)
- Fax/telephone devices
- Personal listening devices (e.g. loop system)

$\textbf{Communication}$
- High tech communication devices
- Low tech communication devices

$\textbf{Home/ADL}$
- Specialised chairs (perch stool/chair)
- Powered beds
- Kitchen aids
- Aids for grasping, holding, reaching (e.g. pick-up/reaching aid, key/door handle opener, non-slip mats)
- Pressure relieving mattress
- Manual bath aids (e.g. bath seat)
- Stair lifts
- Powered hoists (including hydraulic car hoist)
- Adapted toilet seats

$\textbf{Computer general}$
- Standard computers for social/educational purposes
- Specialised software (e.g. EZ keys software)
- Specialised hardware (e.g. Joystick, mouse)
Cross-country analysis on some key themes

- policy importance given to AT
- universality and public-private mix
- coverage across settings and the lifecycle
- service quality standards
- availability of specialist AT expertise
- AT education and training
- information and awareness
- user / consumer choice
- performance monitoring and statistics
The Principles of Universal Design

1. Equitable Use (fair and good value)
2. Flexibility in Use (modes, options)
3. Simple and Intuitive (mental functions)
4. Perceptible Information (sensory)
5. Tolerance for Error (safety, ergonomics)
6. Low Physical Effort (efficiency, force)
7. Size and Space for Approach and Use (BE)
The 7 Principles of Universal Design were developed in 1997 by a working group of architects, product designers, engineers and environmental design researchers, led by the late Ronald Mace (Design Pioneer, internationally recognized Architect) in North Carolina State University.
Principle 1: Equitable Use
The design is useful and marketable to people with diverse abilities.
Principle 2: Flexibility in Use
The design accommodates a wide range of individual preferences and abilities.

A user at a computer table. The table height can be easily adjusted to suit different user needs.

Right & left-handed scissors
Principle 3: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
Principle 4: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.

Each station is color coded and is identified in English, Japanese, and by its accompanying unique symbol. Symbols generally relate to the station’s surroundings.

Looking down the length of the symmetrical platform, lighting accentuates train doorways and the adjoining gates that prevent riders from falling onto the tracks.

Nanakuma Line, Japan
Principle 5: Tolerance for Error
The design minimizes hazards and the adverse consequences of accidental or unintended actions.
Principle 6: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

A person with a transmitter or a cell phone that is Radio Frequency Identification (RFID) compatible can hear wayfinding cues to help guide themselves into or out of a station. Making a fare vending machine accessible for all users.
**Principle 7: Size and Space for Approach and Use**

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Fare gates accommodate a wide variety of users. Note that the gate assembly is long enough so that exiting passengers do not have to slow or stop walking in order for the gate to open. The gate has multiple smart card targets to speed fare collection. Nanakuma line, Japan

The interior of the 100% ultra low floor Alstom Citadis tram has both wide open areas as well as 2X2 seating. Bordeaux light rail, France
There are simple principles to Universal Design which relate to the whole built environment

**Ease of use;**

- For everyone – whatever age, sex, state of health, abilities or disabilities.

- Flexible and adaptable design built in.

- Universal thinking right from the start and right in the heart of the design process; and

- An overall design concept as well as a set of technical standards.
TRADITIONAL APPROACH IS DESIGN FOR SPECIAL NEEDS

Led by Building Regulations:

- Purely functional
- Format room layouts - Doc M packs
- Convenient for professionals
- High prices
- Stigmatising

Courtesy Alison Wright www.easylivinghome.co.uk
“Obliging people to have things they do not like, or about which they have reservations, may result in wholly wasted expenditure”

(Heywood F. ‘Money Well Spent’ 2001)
RESEARCH FINDINGS

Age-related Limitations

• Bending & Stretching
• Hand & Wrist Dexterity
• Visual Acuity
• Safety

Universal Design Responses

• Adjustable-height wall-mounted products
• Lever operated taps & controls
• Colour contrast & controls at correct height
• Thermostatic Controls
• Slip Resistant Flooring
• Invisible layers of support

Courtesy Alison Wright
www.easylivinghome.co.uk
Traditional ‘Medicalised’ Model of Home Adaptations

UNIVERSAL DESIGN

Courtesy Alison Wright
www.easylivinghome.co.uk
BOTH PART ‘M’ COMPLIANT

Courtesy Alison Wright
www.easylivinghome.co.uk
UNIVERSAL DESIGN HOME BATHROOM

- Integral drain creates wet room facility
- Bath panel with toe recess for carer
- Wheelchair accessible WC & basin
- Slip-resistant flooring

Courtesy Alison Wright www.easylivinghome.co.uk
# Building for Everyone (BfE) Booklet series 1-10

- External environment & approach
- Entrances & horizontal circulation
- Vertical circulation
- Internal environment and services
- Sanitary facilities
- Facilities in buildings
- Building types
- Building management
- Planning
- Index and terminology
Booklet 1 – External environment and approach
This booklet aims to encourage designers to provide universal design solutions for the external environment and approaches to buildings that look beyond the recommended requirements of national building regulations.

Figure 1.3 Off-street designated parking spaces.

Key:
A. Preferred access route with dropped kerb or level access; avoiding travel behind parked cars
B. Dropped kerb or level access
C. Standard 2400 (min) x 4800 (min) designated parking space
D. 1200mm wide safety zone for boot access and cars with rear hoists; outside the traffic zone
E. 1200mm wide marked access zone between designated parking spaces

Note: All dimensions in millimetres
Booklet 2 – Entrances & horizontal circulation
This booklet aims to encourage designers to provide universally designed solutions for the entrances to buildings and the horizontal circulation within buildings that look beyond the recommended requirements of national building regulations.
6.4 Key Design Criteria

6.4.1 Reception desks and service counters

Counters and service desks, including reception desks and information counters, should be accessible and understandable to everybody. This includes all visitors or customers in a building as well as personnel who work on the staff side of the counter.

In larger buildings such as public service organisations, and in commercial offices, service counters and reception desks are likely to be large, with several positions for staff and customers. With this type of arrangement, there will be sufficient space to provide counters at different heights.


Reception desks should be placed conspicuously and in a direct, logical position in relation to the main entrance of a building to permit easy identification. The reception desk should also be easy to find from key internal circulation routes such as the foyer, corridors, stairs or lifts. Reception desks should be located away from potential sources of noise, such as a busy bar area or the main entrance doors in buildings, where there is likely to be significant external noise.

Image 2. Shows a young mother with baby and stroller beside a railway track.

Image 3. Example of an airport terminal with signage for departure gates shown.

Universal Design
All parking spaces should be firm, level and even, with no variation in surface profile exceeding 5mm. A 1 in 50 maximum cross-fall gradient is acceptable where necessary to ensure water run-off. An uneven surface or an inclined bay makes transfer into and out of a car very difficult and may present a hazard to some pedestrians.

**Checklist**

- Designated car parking spaces and parent and child spaces provided as close as possible to building entrance or facility.
- Accessible, understandable and usable route between car park and building entrance or facility.
- Clear signage to highlight location of designated parking spaces within a car park.
- Roadway marking and wall- or post-mounted sign to all designated spaces.
- Off-street spaces 2400mm (min) x 4800mm (min) with 1200mm-wide access spaces to both sides and end of spaces.
- On-street spaces 2400mm wide x 7000mm long.
- Level or flush access routes away from vehicle.
- Firm and level surface with cross-fall gradient not exceeding 1 in 50.

1.4.1.3 Multi-storey and underground car parks

Designated car parking spaces should be provided for disabled drivers and passengers in all car parks. Where the car park serves a shopping development, parent and child spaces should also be provided. Designated spaces and parent and child spaces should be on the most convenient level and at the most convenient position for entrance and exit to the building or environment they serve. The spaces should be located adjacent to street or lift exits so that exposure to exhaust fumes is minimized.

Multi-storey and underground car parks should be designed with adequate passive ventilation. Where this is not possible mechanical ventilation may sometimes be required.

Wherever possible, queuing areas should be undercover and incorporate seating, or provide seating close by.

**Image 22.** Shows an example of a well lit Accessible Taxi rank with seating provided for those waiting.

1.4.2 Pedestrian environments

1.4.2.1 Access routes

Access routes in the external environment include paths, pavements and other rights of way such as pedestrian routes through a public space. An access route may be a path through a rural location, a pavement alongside a city centre street.
Free to download as accessible PDF’s or hard copy collection from the Centre for Excellence in Universal design

www.universaldesign.ie/buildingforeveryone
Further Built Environment work CEUD is involved with in 2012 & beyond...

Shared Spaces, Shared Surfaces and Home Zones Research and Recommendations for Ireland

Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland

Key Findings & Recommendations
Further Built Environment work CEUD is involved with in 2012 & beyond…

The purpose in producing Guidelines for Universal Design (UD) Homes is to:

• Inspire people to think differently about better quality homes for everyone.

• Assist in the design and delivery of UD Homes through practical guidelines.
Further Built Environment work CEUD is involved with in 2012 & beyond…

Research, Recommendations & Design Guidance for Dementia & Home design for Ireland looking at New Build and Retro-Fit Homes from a Universal Design approach – Tender Evaluation Stage

Research on Universal Design Educational Campuses across the Life-Cycle (UDLCEC) – Tender Evaluation Stage

Universal Design Homes (UDH) – Cost Benefit Analysis – Project Initiation Stage

IRCSET Universal Design Rating System for buildings – PhD School of Engineering, TrinityHaus, Trinity College - Research on-going, completion 2013
SWiFT 9: Universal Design for Energy Suppliers

The NDA co-produced a world first standard on Universal Design.

Launched on 09-02-2012 the SWiFT 9 provides all Irish Energy Suppliers with practical methods to improve how they communicate with their 1.6 million customers.
Size Data for Universal Design in Ireland
(Anthropometry Research, Penn State, USA)

UNIVERSAL DESIGN
DESIGNING FOR BODY SIZE AND SHAPE

Accommodation
Users that are able to interact with a design in the intended manner are said to be accommodated. Those for whom the design is uncomfortable, unsafe, or otherwise unable to achieve the desired performance are said to be disaccommodated. One goal of Universal Design is to accommodate users regardless of body size and shape.

ADJUSTABILITY
Incorporating adjustability into a design is one method of accounting for body size and shape. For example, a
Institute of Designers in Ireland
Universal Design Award
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EDUCATION

nDA
Universal Design and the Irish Research Council for Science, Engineering & Technology (IRCSET)

- Universal Design for Product Engineering Curriculum (Centre for Bioengineering, Trinity College Dublin)

- Universal Design in the Need-to Knowledge (NtK) Product Development Model, Knowledge Translation (Dublin Institute of Technology, Univ of Buffalo at NY)

- Universal Design Building Rating System (Trinity Haus – Trinity College Dublin)
Universal Design 2nd Level Irish Education Pilot
Designing our Tomorrow (DOT) (Cambridge, UK)
Universal Design 3rd Level Module for first year
Meet the Normals
Food for thought...it took 30,000 years to put wheels on suitcases -

2012 was the 40th anniversary of the wheeled luggage

Universal Design
Thank you

www.universaldesign.ie

nmurphy@ceud.ie

jhubbard@ceud.ie