

The Application of the World Health Organisation's International Classification of Functioning, Disability and Health (ICF) to Universal Design Guidance Standards

Summary Guidance and Examples

Prepared for

Centre for Excellence in Universal Design

National Disability Authority

25 Clyde Road

30th October 2012

The National Disability Authority (NDA) has funded this project. The project was managed by the Centre for Excellence in Universal Design at the NDA. Responsibility for the project (including any errors or omissions) remains with the Work Research Centre. The views and opinions contained in the report are those of the authors and do not necessarily reflect the views or opinions of the National Disability Authority (NDA)



NDA

Údarás Náisiúnta Míchumais
National Disability Authority

Table of Contents

Introduction	3
Person Activity and Environment	4
The Application of the ICF to Design	4
Example 1: The Application of the ICF Terminology to Toaster Design Terminology	6
Example 2: The Application of the ICF Terminology to the Built Environment	10
Example 3: The Application of the ICF Terminology to Service Design	14
Example 4: The Application of the ICF Terminology to Information and Communication Technology (ICT) Design	19
Appendix A: A brief overview to the International Classification of Functioning, Disability and Health (ICF)	24
Appendix B: Presentation to the ISO/IEC Guide 71 JTAG Dublin, October 2012	27



The Application of the World Health Organisation's International Classification of Functioning, Disability and Health (ICF) to Universal Design Guidance Standards

Introduction:

In the introduction to ISO 26800:2011 Ergonomics - General Approach, Principles and Concepts, it is acknowledged that accurate terminology which is based on internationally agreed language is fundamental to design. This is particularly important where human involvement is expected.¹

This document explains how the International of Classification of Functioning, Disability and Health (ICF) can be applied to three interacting design components, the Person, the Activity and the Environment (PAE) in the development of design guidance standards to achieve accurate and consistent terminology.

It is intended to provide an overview of how using the ICF can result in a more precise, consistent and internationally recognised language and terminology to represent the interaction of PAE in design including:

- Developing design guidance standards,
- Making design decisions,
- Preparing design specifications,
- Evaluating design proposals, and
- Promoting Universal Design.

In addition, it contains examples to demonstrate the application of the ICF to represent the three design variables of PAE in relation to:

1. A product (Toaster),
2. A component of a built environment (Tap/Faucet),
3. A service (Reception Desk),
4. Information and Communication Technology (ICT) (Mobile Phone).

¹ ISO 26800:2011 Ergonomics -- General approach, principles and concepts, Available at: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=42885

This document is based on a research project involving an international review which considered in particular the application of the ICF to design activities and the development of a Guidance document on integrating optimal terminology and classifications to improve design guidance standards. A PowerPoint presentation, which was prepared for the ISO/IEC Guide 71 JTAG Dublin in October 2012 to provide an overview of the project is included in Appendix B.

Person, Activity and Environment:

Taking account of the interaction of the three components Person, Activity and the Environment (PAE) is key to understanding, representing and communicating design concepts relating to products, services or the built environment. By addressing each of these in relation to design, the impact on accessibility and usability can be specified in a detailed and consistent manner.

- **Activity** refers to what a person must do to use a product, service or built environment.
- **Person** refers to the mental and physical functions and personal characteristics that may impact on carrying out an activity.
- **Environment** refers to the design factors, including physical, structures, social and attitudinal factors, that may act as facilitators or barriers to a person's performance in using products, services or the built environment.

The Application of the ICF to Design:

One of the intended applications of the ICF is environmental assessment for Universal Design (WHO 2001).² It can be used to apply a consistent and internationally agreed classification and terminology to represent design concepts. Appendix A provides an overview of the domains of the ICF and the way in which terms are coded and applied.

The ICF framework has five main components. Four of these are classified using codes to represent a different aspect of the person and the environment. The classification consists of *Body Functions* (b codes); *Body Structures* (s codes); *Activity and Participation* (d codes) and *Environment* (e codes). The fifth component is *Personal Factors* (pf) which are not encoded within the Classification.

Identifying appropriate ICF codes for design terms and concepts is governed by a set of linking rules. These are described in more detail in the Guidance on the Application of the ICF and Related Resources to Improve Universal Design Guidance Standards. The most relevant rules are:

² WHO (2001) *Towards a Common Language for Functioning, Disability and Health: ICF*, World Health Organisation, Geneva,
<http://www.who.int/classifications/icf/training/icfbeginnersguide.pdf>

- A prerequisite for accurate and appropriate linking is a working knowledge of the ICF.³
- A term and its related concept should be linked to the most precise ICF category.
- Where no corresponding ICF code is found do not use the so-called “other specified” ICF categories but document the additional information.
- The original domain term and the matching ICF code(s) should be recorded together in the resultant documentation produced by the mapping process.
- When the ICF cannot provide an appropriate code, alternates from other sources should be sought. While the ICF provides detailed codes for some of these, it is necessary in some cases to augment it using related resources particularly in relation to more detailed environmental concept and personal characteristics.

³ International Classification of Functioning, Disability and Health (ICF): WHO – FIC Information Sheet September 2010. Available at:
<http://www.ifhima.org/docs/ICF%20%20Information%20sheet%2029112010.pdf>

Example 1:

The Application of the ICF Terminology to Toaster Design Terminology

The table below presents a way to organise the three interacting components (PAE) and the associated ICF terminology in the design of a rotary toaster time control knob.

The first column of the table represents the three components of Person, Activity and Environment. The second and third columns specify the domain and source of the terms used. The fourth column contains the descriptive terms. The final column specifies the associated code (where this is available).

The last row of the table indicates the design features which can be used to facilitate accessibility and usability.

A small, smooth control knob can be difficult to grip for anyone with wet hands or a limitation in grasping and twisting. Easy to grasp and twist knobs facilitate an improvement in performance.

Poor colour contrast on the scale of the rotary control knob, as shown in the adjacent image of a toaster, can make it difficult for all people to use the control effectively. Good colour combinations help to provide good contrast between the control and the gradient display.



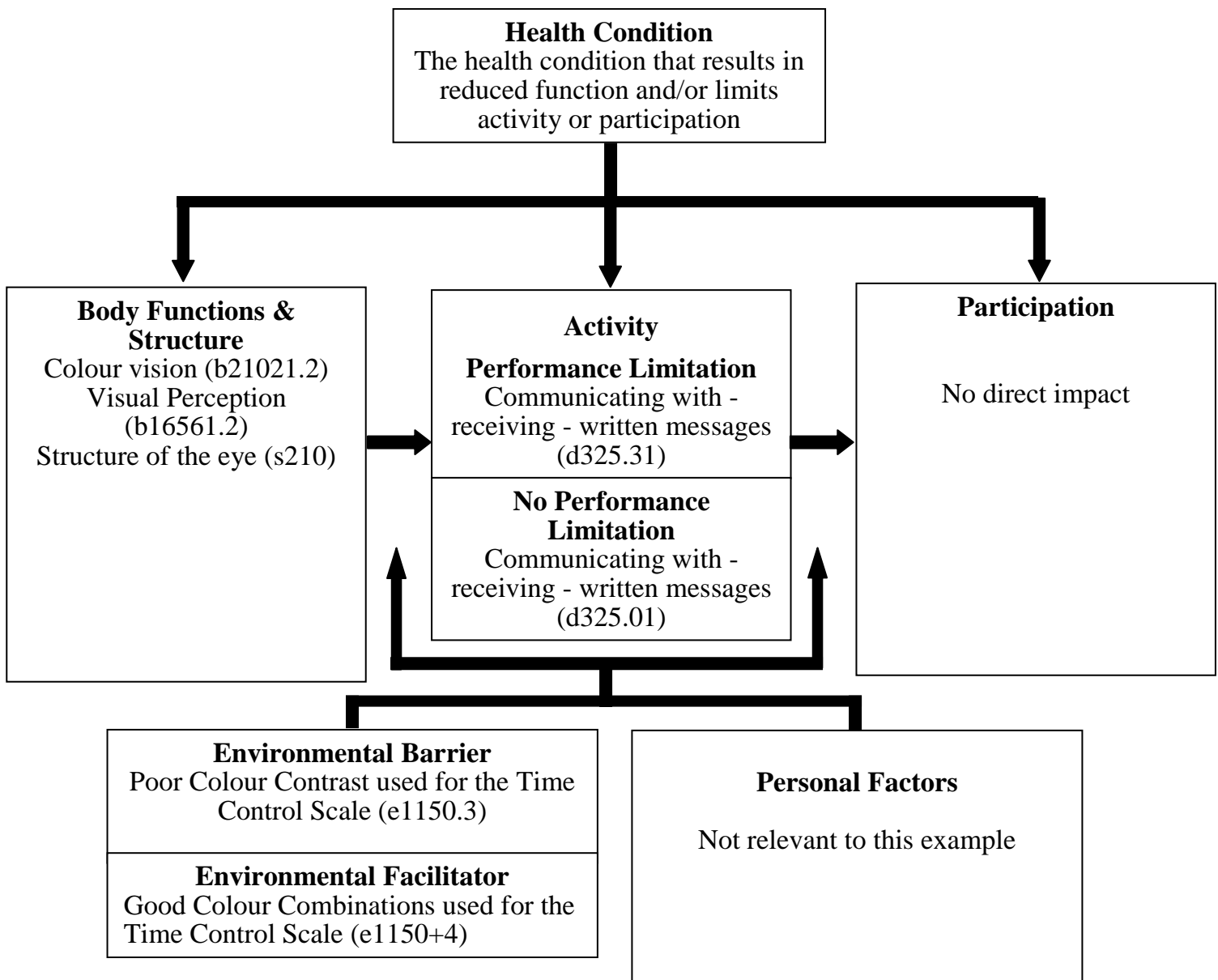
The table below illustrates the way in which using the ICF to specify the three PAE components and their interaction can assist in the definition of potential environmental barriers and the identification of design factors that can facilitate wider accessibility and usability.

Product: Toaster
Task or Goal: Adjusting the time setting for toasting bread
Operational Component: Rotary Control Knob

PAE Variable	ICF Domains	Source of Terms	Descriptive Terms	Code
Activity	Activities (Tasks)	ICF	Communicating with-receiving-written messages	d325
			Manipulating	d4402
			Reaching	d4452
			Grasping	d4401
			Turning or twisting	d4453
		Non-ICF	*	
Person	Body Functions	ICF	Joint mobility	b710
			Colour vision	b21021
			Visual Perception	b16561
	Body Structures	ICF	Structure of the Hand	s7302
			Structure of the eye	s210-s220
			Non-ICF	*
	Personal Factors		*	
Environment	Environmental Barriers	ISO/IEC TR22411	Poor Colour Contrast	8.5.2
			Hard to grip knob	8.12.3.1
	Environmental Facilitators (Universal Design Factors)	ISO/IEC TR22411	Good Colour combinations between control and time gradients	8.5.2
			Easy to grasp and twist control knob - Ease of handling	8.12.3.1

* Non-ICF and Personal Factors were not considered relevant to this example

For illustration purposes the diagram below uses the ICF framework to represent the way in which the absence of the Universal Design Factor, good colour contrast, can act as a barrier to a person with a moderate seeing impairment in differentiating colours. The ICF has a system of qualifying scales (values are shown as suffixes separated from the code by a decimal point or plus sign) that are explained in Appendix 1. The diagram is explained in the text below it.



- The Health Condition box at the top of the figure indicates the health condition that is impacting on Body Functions, Structures, Activity or Participation. This is not coded in the ICF but is classified using the

International Classification Diseases 10th Edition (ICD 10). There is no relevant health condition in this example.

- The Body Functions and Structures relevant to using the scale on a rotary toaster time control knob are specified in the box on the left hand side of the diagram. In this example, the person has a moderate impairment of colour vision (b20012.2) relating to the structure of the eye indicated by the qualifier **XXX.2**.
- The central box lists the Activity involved in using the scale on a rotary toaster time control knob - Communicating with - receiving - written messages (d325).
 - The top part of the box indicates a limitation. The first qualifier **XXX.3_** indicates that the person is experiencing a severe limitation in the performance of reading the written symbols on the toaster as a result of poor colour combinations (see environmental barrier box) and the second qualifier **XXX._1** indicates that he or she would experience a mild limitation in the capacity to perceive written messages in colour based on his/her inherent or intrinsic attributes (d325.31).
 - The bottom part of the box indicates that the person has no difficulty reading the symbols as a result of good colour combinations in the design of the scale. No limitation in performance of the activity is indicated by the performance qualifier **XXX.0_**. The capacity qualifier would remain the same **XXX._1** (d325.01).
- The right hand box indicates that in this activity there is no impact on the person's participation in life situations.
- The Environmental Factor is listed in the left hand lower box.
 - In the upper part of the box - poor colour contrast used on the scale of the rotary toaster control knob – is indicated as a substantial environmental barrier for the person by the qualifier **XXX.3**. The ICF code in the diagram denotes general products and technology for personal use in daily living (e1150.3).
 - In the bottom part of the lower left box, good colour combinations on the scale of the rotary toaster time control knob is indicated by the qualifier **XXX +4** as a complete facilitator (e1150+4).
- The lower right hand box indicates that Personal Factors are not relevant to this example.

Example 2

The Application of the ICF Terminology to the Built Environment

The table below presents a way to organise the three interacting components (PAE) and the associated ICF terminology in the design of an attribute of a building -a tap or faucet (water flow control).

The first column of the table represents the three components of Person, Activity and Environment. The second and third columns specify the domain and source of the terms used. The fourth column contains the descriptive terms. The final column specifies the associated code (where this is available).

The last row of the table indicates the design features which can be used to facilitate accessibility and usability.

A tap with round handles, shown in the adjacent image, can be difficult to grip for anyone with soapy hands or with a limitation in grasping and twisting.



Lever style handles, shown in the second image, make it easier to control the flow of water regardless of grip capacity.



The table illustrates the way in which using the ICF to specify the three PAE components and their interaction can assist in the definition of potential environmental barriers and the identification of design factors that can facilitate accessibility and usability.

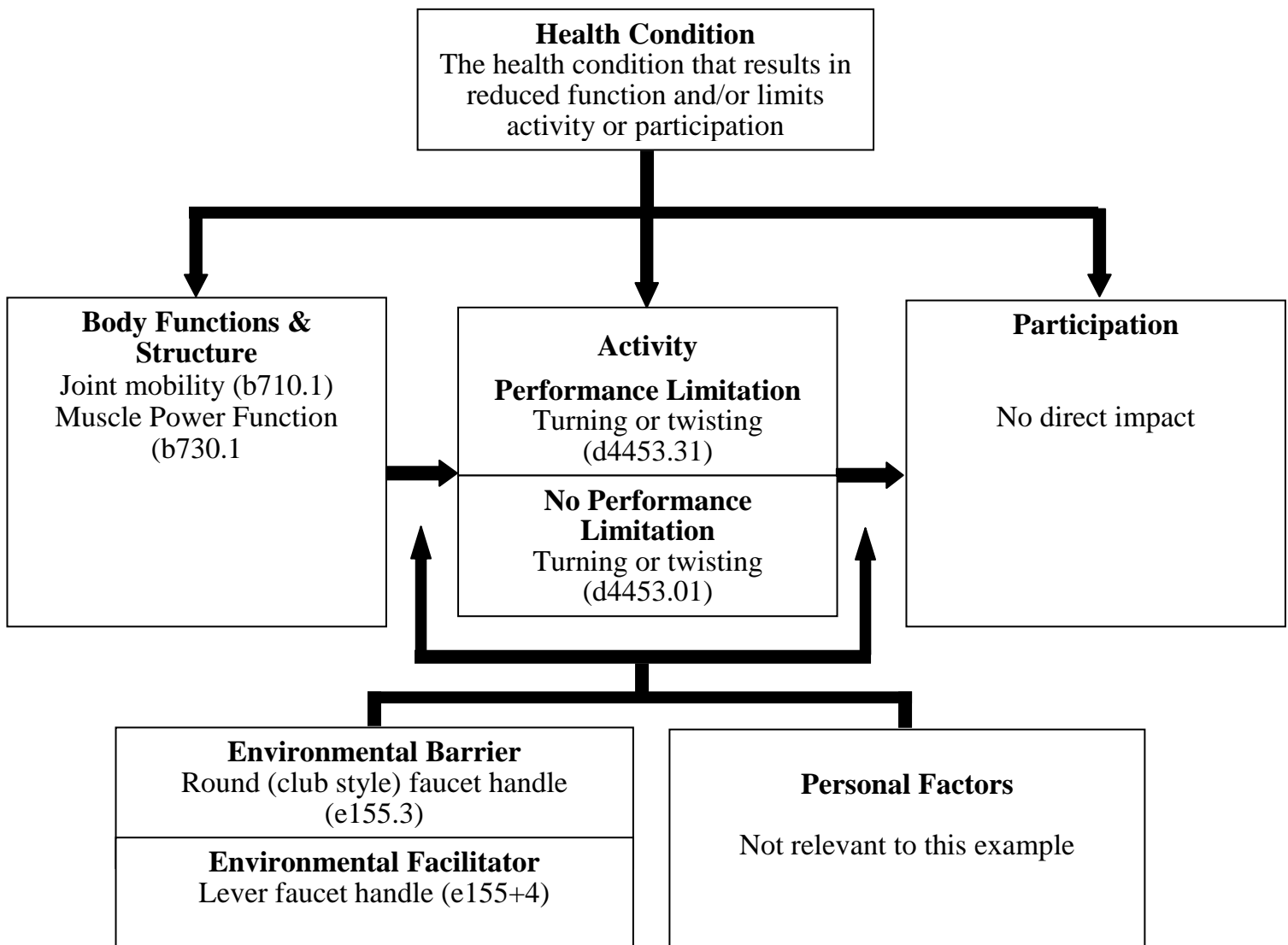
Product: Tap/Faucet
Task or Goal: Adjusting the flow of water
Operational Component: Manipulating Tap/Faucet Handles

PAE Variable	ICF Domains	Source of Terms	Descriptive Terms	Code
Activity	Activities (Tasks)	ICF	Manipulating	d4402
			Reaching	d4452
			Grasping	d4401
			Turning or twisting	d4453
		Non-ICF	*	
Person	Body Functions	ICF	Joint mobility	b710
			Muscle Power Function	b730
			Control of voluntary Movement Functions	b760
		Non-ICF	*	
	Body Structures	ICF	Structure of upper arm	s7300
			Structure of Forearm	s7301
			Structure of Hand	S7302
		Non-ICF	*	
Personal Factors		*		
Environment	Environmental Barriers	ISO/IEC TR22411	Round hard to grip faucet handle	8.12.3.1
	Environmental Facilitators (Universal Design Factors)	ISO 21542:2002 ⁴	Lever Style Faucet Handle	26.11

* Non-ICF and Personal Factors were not considered relevant to this example

⁴ ISO 21542:2002 Accessibility and Usability of the Built Environment

For illustration purposes the diagram below uses the ICF framework to represent the way in which the absence of the Universal Design Factor, ease of handling (Guide 71:2001 8.12.3.1), can act as a barrier to a person with a moderate impairment in gripping and twisting. The ICF has a system of qualifying scales (values are shown as suffixes separated from the code by a decimal point or plus sign) that are explained in the Appendix. The diagram is explained in the text below it.



- The Health Condition box at the top of the figure indicates the health condition that is impacting on Body Functions, Structures, Activity or Participation. This is not coded in the ICF but is classified using the International Classification Diseases 10th Edition (ICD 10). In this case a

number of health conditions, including arthritis, cerebral palsy or multiple sclerosis, could result in activity limitations with gripping and twisting.

- The Body Functions and Structures relevant to using the water control on a tap are specified in the box on the left hand side of the diagram. In this example, the person has a mild impairment of joint mobility (b710.1) and muscle power (b730.1) relating to the structure of the hand and arm as indicated by the qualifier **XXX.1**.
- The central box lists the Activity involved in using a tap/faucet handle - Turning or twisting (d4453).
 - The top part of the box indicates a limitation. The first qualifier **XXX.3_** indicates that the person is experiencing a severe limitation in the performance of turning or twisting as a result of the shape of the handles (see environmental barrier box) and the second qualifier **XXX._1** indicates that he or she would experience a mild limitation in the capacity to turn and twist based on his/her inherent or intrinsic attributes (d4453.31).
 - The bottom part of the box indicates that the person has no difficulty in turning or twisting the lever handles. No limitation in performance of the activity is indicated by the performance qualifier **XXX.0_**. The capacity qualifier would remain the same **XXX.1_** (d4453.01).
- The right hand box indicates that there is no impact on the person's participation in life situations.
- The Environmental Factor is listed in the left hand lower box.
 - In the upper part of the box – the round tap handles – are indicated as a substantial environmental barrier for the person by the qualifier **XXX.3**. The ICF code in the diagram denotes design, construction and building products and technology of buildings for private use (e155.3).
 - In the bottom part of the box, the lever handles are indicated by the qualifier **+4** as a complete facilitator (e155+4).
- The lower right hand box indicates that Personal Factors are not relevant to this example.

Example 3

The Application of the ICF Terminology to Service Design

The table below presents a way to organise the three interacting components (PAE) and the associated ICF terminology in the design of an attribute of a service – a reception desk.

The first column of the table represents the three components of Person, Activity and Environment. The second and third columns specify the domain and source of the terms used. The fourth column contains the descriptive terms. The final column specifies the associated code (where this is available).

The last row of the table indicates the design features which can be used to facilitate accessibility and usability.

A reception desk is an important aspect of customer service. It is the first point of contact in many services including banks, hotels and health services. People of small stature and those who use wheelchairs often face barriers in relating to service staff behind reception desks which are too high. This interferes with eye contact and effective communication.

A desk with a countertop that is between 700 and 800mm high, as illustrated in the adjacent image, provides a comfortable and welcoming environment which facilitates better participation on the part of the customer.

The table below illustrates the way in which using the ICF to specify the three PAE components and their interaction can assist in the definition of potential environmental barriers and the identification of design factors that can facilitate accessibility and usability.



Service:

Health Service

Task or Goal:

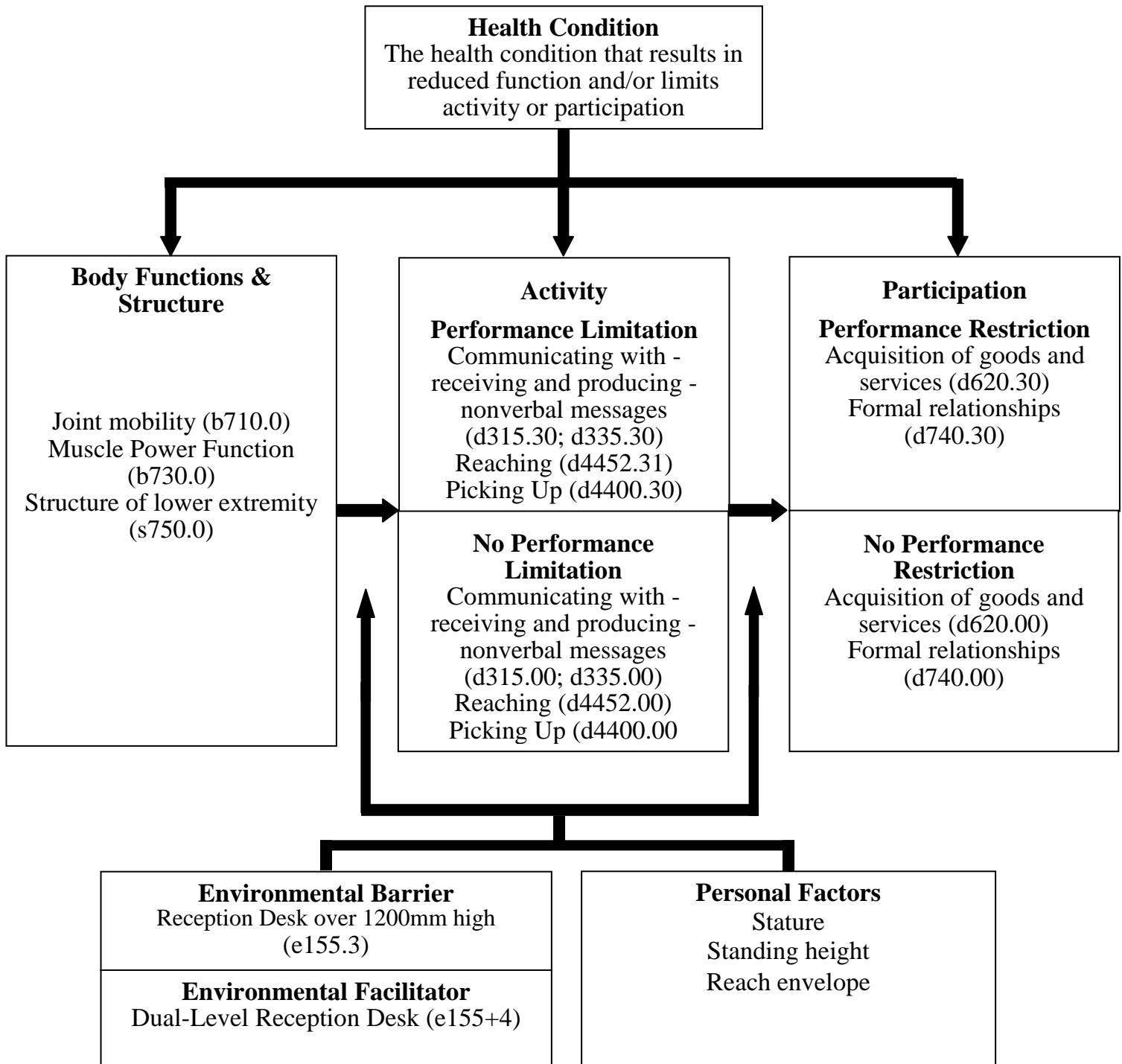
Making an appointment to see a consultant

Operational Component: Reporting to the Reception Desk

PAE Variable	ICF Domains	Source of Terms	Descriptive Terms	Code
Activity	Activities (Tasks)	ICF	Acquisition of Goods and Services	d620
			Relating with strangers	d730
			Moving around within buildings other than the home	d4601
			Reaching	d4452
			Picking Up	d4400
		Non-ICF	Making Eye-contact	
Person	Body Functions	ICF	Joint mobility	b710
			Muscle Power Function	b730
			Orientation to Person	b1142
	Body Structures	ICF	Structure of lower extremity	s750
			Non-ICF	*
	Personal Factors	ISO/IEC TR22411	Stature Standing height Sitting Height Reach envelope	9.3 Table 17 & 9.3 Table 19
Environment	Environmental Barriers	OmniClass	Reception Desk over 1200mm high	23-21111123 & 49-711921
		ICF	Lack of Awareness on the part of the receptionist	e445
	Environmental Facilitators (Universal Design Factors)	OmniClass	<ul style="list-style-type: none"> Reception desks and service counters with a work surface at two different levels to facilitate use by people at a range of heights and in either a seated or standing position The lower work surface should be a maximum of 760mm above floor level and have a clearance to the underside of 700mm (Building for Everyone Booklet 6 - Facilities in buildings) 	49-711517
		ICF	<ul style="list-style-type: none"> Diversity training for customer staff 	e5850

*Not considered relevant to this example

For illustration purposes the diagram below uses the ICF framework to represent the way in which the absence of a dual-level reception desk can act as a barrier to a person of short stature. The ICF has a system of qualifying scales (values are shown as suffixes separated from the code by a decimal point or plus sign) that are explained in the Appendix. The diagram is explained in the text below it.



- The Health Condition box at the top of the figure indicates the health condition that is impacting on Body Functions, Structures, Activity or Participation. This is not coded in the ICF but is classified using the International Classification Diseases 10th Edition (ICD 10). There is no relevant health condition in this example.
- The Body Functions and Structures relevant to using a reception desk are specified in the box on the left hand side of the diagram. In this example, the person has a no impairment of Joint mobility (b710.0) or Muscle Power Function (b730.0) relating to the structure of the lower extremity indicated by the qualifier XXX.0.
- The central box lists the activities involved in using a reception desk - Communicating with - receiving - nonverbal messages (d315; d335 Producing nonverbal messages (d335); Reaching (d4452) and Picking Up (d4400).
 - The top part of the box indicates the limitations. The first qualifier XXX.3_ indicates that the person is experiencing a severe limitation in the performance of communicating with -receiving and producing - nonverbal messages, reaching and picking up as a result of the height of the reception desk (see environmental barrier box) and the second qualifier XXX._0 indicates that he would experience no limitation in communicating using non-verbal messages (d315.30 and d335.30) or picking up (d4400.30) although he would experience a mild limitation in reaching based on his inherent or intrinsic attributes represented by the qualifier XXX._1 (d4452.31).
 - The bottom part of the box indicates that the person has no difficulty in performing these activities as indicated by the performance qualifiers XXX.0_ for all activities.
- The right hand box lists the types of involvement in life situation - Participation that are impacted.
 - The top part of the box indicates the limitations in participation. The person has a severe limitation in participating in the Acquisition of goods and services (d620.30) and in Formal relationships (d740.30) with the receptionist as indicated by the first qualifier XXX.3_, although based on his inherent or intrinsic attributes he would have no difficulty doing so represented by the second qualifier XXX._0 .
 - The bottom part of the box indicates that the person has no difficulty in the acquisition of goods and service and formal relationships indicated by the performance qualifier XXX.0_ for both areas of participation.
- The Environmental Factor is listed in the left hand lower box.

- In the upper part of the box – the reception Desk over 1200mm high – is indicated as a substantial environmental barrier for the person by the qualifier **XXX.3**, i.e. Design, construction and building products and technology of buildings for public use (e150.3).
- In the bottom part of the box, dual-level reception desk is indicated by the qualifier **XXX+4** as a complete facilitator (e155+4).
- The lower right hand box indicates that the Personal Factors: Stature, Standing height and Reach envelope are affecting the person's activity and participation.

Example 4:

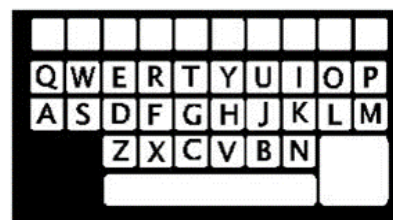
The Application of the ICF Terminology to Information and Communication Technology (ICT) Design

The table below presents a way to organise the three interacting components (PAE) and the associated ICF terminology in the design of an attribute of an ICT device – a mobile phone.

The first column of the table represents the three components of Person, Activity and Environment. The second and third columns specify the domain and source of the terms used. The fourth column contains the descriptive terms. The final column specifies the associated code (where this is available).

The last row of the table indicates the design features which can be used to facilitate accessibility and usability.

A substantial challenge for any ICT user who changes to a new device is coming to terms with the new interfaces, applications and defaults integrated into the new device. Familiarity with previous ways of doing things can act as a barrier to learning how to use the new device efficiently. For example, a person, who has been routinely using a standard 4 X 3 telephone keypad array, as shown in the upper image, over an extended period of time will experience difficulties, at least in the early stages, using a QWERTY layout for an onscreen keypad, as shown in the lower image, to operate a mobile phone. This occurs because the routines developed in using the numeric keys 0-9, the symbol keys star (*) and the number sign (#) on the standard telephone keypad interfere with efficient use of a QWERTY keypad which displays all alphabetic and numeric characters. This interference can represent a greater challenge for someone with a learning impairment. Providing an option to select a standard telephone keypad on-screen display could eliminate this difficulty.



The table below illustrates the way in which using the ICF to specify the three PAE components and their interaction can assist in the definition of potential environmental barriers and the identification of design factors that can facilitate accessibility and usability.

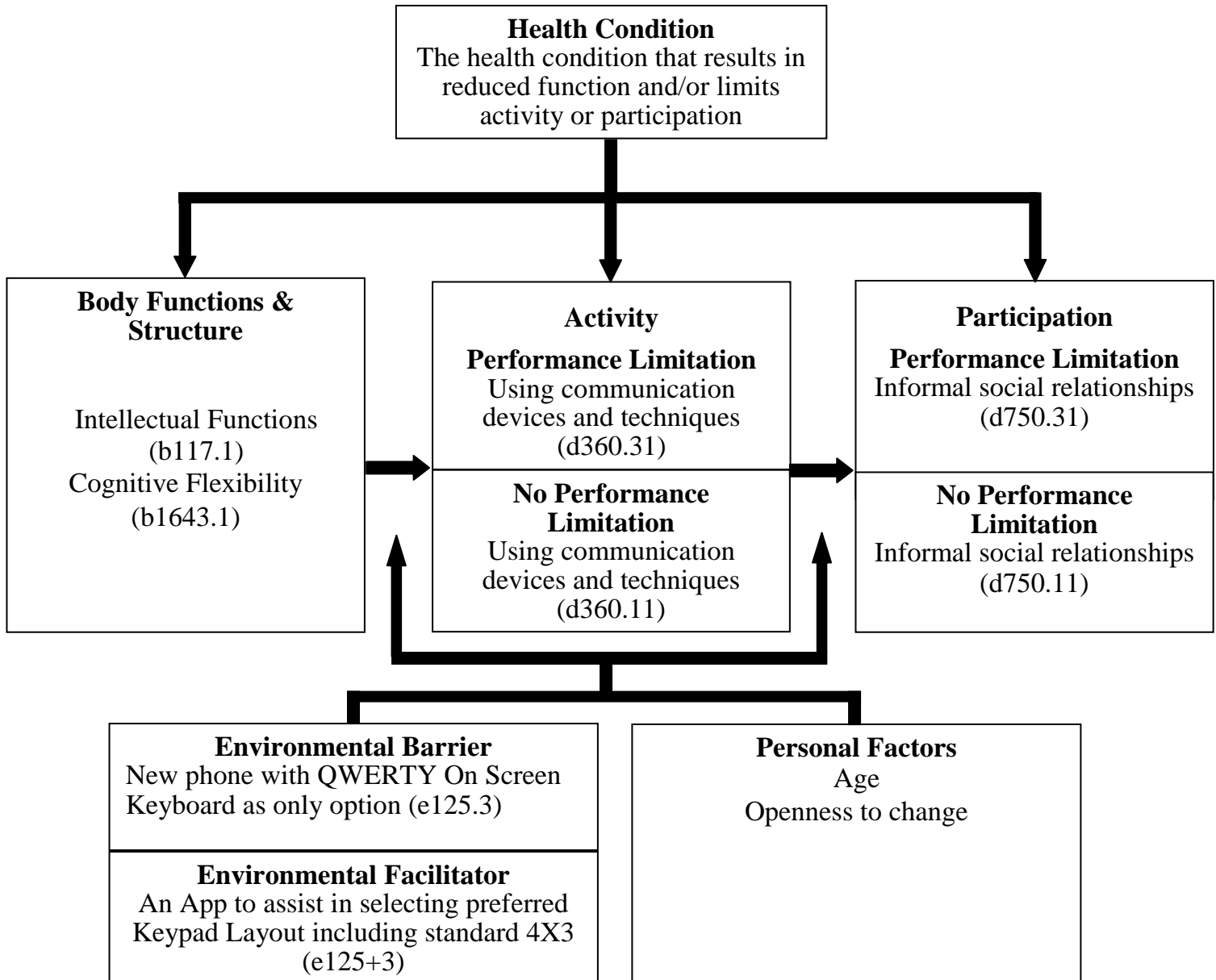
ICT Device
Task or Goal:
Operational Component:

Mobile Phone
Sending a text message
Using the keypad

PAE Variable	ICF Domains	Source of Terms	Descriptive Terms	Code
Activity	Activities (Tasks)	ICF	Solving problems	d175
			Using Communication devices and techniques	d360
			Grasping	d4401
			Manipulating	d4402
		Non-ICF	*	
Person	Body Functions	ICF	Intellectual Functions	b117
			Cognitive Flexibility	b1643
			Mobility of Joint Functions	b710
			Stability of Joint Functions	b715
			Control of Voluntary Movement Functions	b760
	Non-ICF	*		
	Body Structures	ICF	Structure of the Brain	s110
			Structure of the Hand	s7302
		Non-ICF	*	
Personal Factors	ICF	Age Openness to change	pf	
Environment	Environmental Barriers	ISO/IEC TR22411	Inflexible keypad format options	8.2
			Small keypad size	8.3.3 & 8.6
			Touch sensitivity not adaptable	8.2.3.2
	Environmental Facilitators (Universal Design Factors)	ISO/IEC TR22411	An App to assist in selecting preferred Keypad Layout including standard 4X3 - Alternative formats	8.2
			Adjustable keypad size format – Layout & Size and style of font and symbols	8.3.3 & 8.6
			Adjustable touch sensitivity - Tactile Information	8.2.3.2

*Not considered relevant to this example

For illustration purposes the diagram below uses the ICF framework to represent the way in which the absence of an App to select a preferred on-screen keyboard display can act as a barrier to a person with mild intellectual impairment, who is skilled in using the standard 4 X 3 telephone keypad array, to send text messages with a new phone using a QWERTY display. The ICF has a system of qualifying scales (values are shown as suffixes separated from the code by a decimal point or plus sign) that are explained in the Appendix.



- The Health Condition box at the top of the figure indicates the health condition that is impacting on Body Functions, Structures, Activity or Participation. This is not coded in the ICF but is classified using the International Classification Diseases 10th Edition (ICD 10). In this example, cognitive inflexibility can arise from a number of conditions including Aspergers Syndrome, Downs Syndrome or other Intellectual Impairment.
- The Body Functions and Structures relevant to adapting from a routine to a novel situation are specified in the box on the left hand side of the diagram. In this example, the person has a mild impairment of Intellectual function (b117.1) and Cognitive flexibility (b1643.1) relating to the structure of the brain indicated by the qualifier **XXX.1**.
- The central box lists the Activity involved in using a mobile phone - Using communication devices and techniques (d360).
 - The top part of the box indicates the limitation. The first qualifier **XXX.3_** indicates that the person is experiencing a severe limitation in the performance of using the communication device (see environmental barrier box) and the second qualifier **XXX._1** indicates that she would experience a mild limitation based on her inherent or intrinsic attributes (d360.31).
 - The bottom part of the box indicates that the person has a mild difficulty in performing the activity which is in line with her capacity indicated by the performance and capacity qualifiers **XXX.11**.
- The right hand box lists the type of involvement in life situation - Participation that is impacted.
 - The top part of the box indicates the limitation in participation. The person has a severe limitation in participating in Informal social relationships (d750.31) indicated by the first qualifier **XXX.3_**, although based on her inherent or intrinsic attributes she would have a mild difficulty doing so represented by the capacity qualifier **XXX._1**.
 - The bottom part of the box indicates that the person has a mild difficulty in participating in informal social relationships (d750.11) which is in line with her capacity indicated by the performance and capacity qualifiers **XXX.11**.
- The Environmental Factor is listed in the left hand lower box.
 - In the upper part of the box – the new phone with QWERTY On Screen Keyboard as the only option is indicated as a substantial environmental barrier for the person by the qualifier **XXX.3**, i.e. Products and technology for communication (e125.3).

- In the bottom part of the box, an App for selecting a preferred keypad layout including standard 4X3 is indicated by the qualifier **XXX+3** as a substantial facilitator (e125+3).
- The lower right hand box indicates that the Personal Factors age and openness to change can also affect the person's activity and participation in this example.

Appendix A

A brief overview to the International Classification of Functioning, Disability and Health (ICF)

The ICF characterises disability as the result of an interaction between an individual and the environment across the lifespan using a language and terminology which is positive. It is often referred to as a universal classification of disability in that it is as relevant to a person who needs spectacles to read as it is to someone who is unable to see anything at all. It incorporates both medical and social aspects of disability and is independent of causality so that reduced functioning is treated the same whether due to birth, trauma or ageing. It can document the impact of context (i.e. the physical and psychosocial environment) on people experiencing reduced functioning across cultures and national boundaries.

The domains contained in the ICF are described from the perspectives of Body Functions and Structures; Activities and Participation and Environmental factors that intervene to enable or disable a person. In this way, it can represent useful profiles of an individual's functioning, disability and health in various domains and document the environmental barriers or facilitators. In the ICF disability and functioning are viewed as outcomes of interactions between health conditions and contextual factors (i.e. environmental and personal factors).

The definition and the prefix used to denote each component are presented below (WHO 2001, p10)⁵.

- **Body functions** (prefix 'b') are the physiological functions of body systems (including psychological functions).
- **Body structures** (prefix 's') are anatomical parts of the body such as organs, limbs and their components. Impairments are problems in body function or structure such as a significant deviation or loss.
- **Activity** (prefix 'd') is the execution of a task or action by an individual.
- **Activity limitations** are difficulties an individual may have in executing activities.
- **Participation** (prefix 'd') is involvement in a life situation.

⁵ International Classification of Functioning, Disability and Health (ICF): WHO – FIC Information Sheet September 2010. Available at:

<http://www.ifhima.org/docs/ICF%20%20Information%20sheet%2029112010.pdf>

- **Participation restrictions** are problems an individual may experience in involvement in life situations.
- **Environmental factors** (prefix ‘e’) make up the physical, social and attitudinal environment in which people live and conduct their lives.

Personal factors refer to attributes of the person which are not related to functioning or disability such as age, gender or height. These are not coded in the ICF

Each ICF term is encoded using the appropriate component letter followed by a numeric code (e.g. Seeing Functions are coded as b210, Visual Acuity Functions as b2100 and Binocular Acuity of Distant Vision as b21000). The ICF codes are only complete with the presence of a qualifier. *Qualifiers record the presence and severity of a problem in functioning at the body, person and societal levels* (WHO 2001, p11).⁶

ICF Qualifiers (Suffixes)

A 5 point qualifier scale is used by the ICF for Body Function and Body Structures to indicate the extent of limitation, where 0 means no problem and 4 means a complete problem (e.g. a severe impairment of Visual Acuity is indicated as b2100.3) (see Table A1.1). It appears following a decimal point after the code.

Table A1.1: The primary qualifiers for the domains of body function and structure

ICF Domain	Impairment Qualifiers				
	None	Mild	Moderate	Severe	Complete
‘b’ Codes	None	Mild	Moderate	Severe	Complete
Body Function	bXXX.0	bXXX.1	bXXX.2	bXXX.3	bXXX.4
‘s’Codes	None	Mild	Moderate	Severe	Complete
Body Structure	sXXX.0	sXXX.1	sXXX.2	sXXX.3	sXXX.4

Two similar 5 point scales are used with Activity and Participation (‘d’ codes) shown by two digits following a decimal point after a code. The first digit after the decimal point indicates the level of performance of a person in his or her current environment. The second digit after the decimal point denotes his or her capacity to carry out the activity, or participate, in a standard environment with no assistance (e.g. a moderate limitation in the activity of reading which is resolved by the use of corrective lenses is denoted by d166.02). The performance and

⁶ International Classification of Functioning, Disability and Health (ICF): WHO – FIC Information Sheet September 2010. Available at:

<http://www.ifhima.org/docs/ICF%20%20Information%20sheet%2029112010.pdf>

capacity qualifiers for Activity and Participation codes are presented in Table A1.2. The digit not shown is depicted by the letter ‘y’ in the table.

Table A1.2: The primary qualifiers for the domains of Activity and Participation

ICF Domain		Extent of Limitation				
		None	Mild	Moderate	Severe	Complete
‘d’Codes						
Activity & Participation	Performance	dXXX.0y	dXXX.1y	dXXX.2y	dXXX.3y	dXXX.4y
	Capacity	dXXX.y0	dXXX.y1	dXXX.y2	dXXX.y3	dXXX.y4

ICF Environmental factors are qualified by two 5 point scales, each of which is denoted by the way in which it is linked to the code. One scale denotes that the factor is a barrier. The other scale indicates that it is a facilitator (e.g. the fact that corrective lenses are a complete facilitator can be denoted by e150+4 - General products and technology for personal use in daily living and poor lighting which is a substantial barrier to reading by e2401.3 - Light quality). These are presented in Table A1.3.

Table A1.3: The primary qualifiers for the domain of Environmental Factors

ICF Domain		Extent of Barrier or Facilitator				
		None	Mild	Moderate	Substantial	Complete
‘e’ Codes						
Environment	Barrier	None	Mild	Moderate	Substantial	Complete
		eXXX.0	eXXX.1	eXXX.2	eXXX.3	eXXX.4
	Facilitator	None	Mild	Moderate	Substantial	Complete
		eXXX+0	eXXX+1	eXXX+2	eXXX+3	eXXX+4

While the ICF covers many of the characteristics of the Person, Activity and the Environment, there are areas in which it needs to be augmented. There is no single source that encodes personal factors in a systematic way and so this requires the designer to generate relevant characteristics such as age, gender or stature. Related resources may also be required to describe more detailed environmental factors such as design factors.⁷

⁷ Systematized Nomenclature of Medicine--Clinical Terms (SNOMED-CT) Available at: <http://www.ihtsdo.org/snomed-ct/>

Appendix B

Presentation to the ISO/IEC Guide 71 JTAG Dublin, October 2012

**Presentation to the
ISO/IEC Guide 71 JTAG
Dublin, October 2012**

**The Centre for
Excellence in
Universal Design**



NDA

Údarás Náisiúnta Michumais
National Disability Authority



Universal Design

**Integrating the WHO-ICF and
Related Resources to Improve
Universal Design Guidance
Standards**

**Researchers:
Dr. Donal McAnaney &
Dr. John Gilligan
The Work Research Centre (WRC)
Dublin**

NDA

The views and opinions contained in this presentation are those of the authors and do not necessarily reflect the views or opinions of the National Disability Authority (NDA) or the CEUD

Background of the Researchers

Dr. John Gilligan, Lecturer in Computer Science.

- Knowledge Representation using ICF,
- Universal Design,
- Formal Systems Specification and Design,
- Intelligent Software Design Development,
- Assistive Technology.

Dr. Donal McAnaney, Senior Research Consultant, WRC

- 20 years experience in the application of ICIDH and ICF in the domains of education, employment and social inclusion,
- Lecturer in Inclusive Education and Rehabilitation,
- Extensive international research experience using the ICF in the fields of active inclusion, social protection and health promotion.

NDA

Universal Design



Project Deliverables

A systematic review of international literature on the integration of the ICF and related resources into non-medical systems and domains

- Where have they been integrated?
- Why have they been integrated?
- How have they impacted on development, usability and effectiveness?

NDA

Universal Design



Project Deliverables contd.

- Recommendations, based on best practice, on the application of terminology and classifications to optimise UD guidance standards in terms of:
 - Human Activities
 - Personal Characteristics
 - Environmental Considerations
- A guidance document with four examples – buildings, services, product and ICT

NDA

Universal Design



Why the ICF was the Focus of the Project? contd.

Towards a Common Language for Functioning, Disability and Health: ICF (WHO, 2001)

Clearly specifies amongst the intended ICF Applications:

“... environmental assessment for universal design, implementation of mandated accessibility, identification of environmental facilitators and barriers, and changes to social policy” (p. 6)

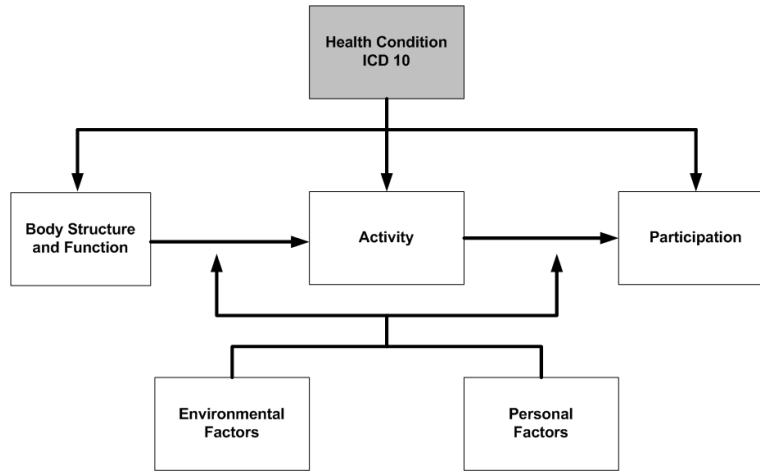
<http://www.who.int/classifications/icf/training/icfbeginnersguide.pdf>

NDA

Universal Design



A Brief Overview of the ICF



NDA

Universal Design

Documenting the Impact of Guide 71 Design Factor 8.18 using ICF Codes and Qualifiers (Person with moderate limitations)

Walking in a Public Building

Activity dxxx.yy		<ul style="list-style-type: none"> Walking (d450) Moving around in different locations (d460)
Person bxxx.y sxxx.y	Has a moderate Impairment of joint mobility A mild limitation in Capacity to walk and moving around (in a standard environment)	<ul style="list-style-type: none"> Joint mobility (b710.2) Structure of the lower extremity (s750.2) Walking (d450.y1) Moving around in different locations (d460.y1)
Environment exxx.y exxx+y	A building with a slippery surface can be a substantial Environmental Barrier	<ul style="list-style-type: none"> Design, construction and building products and technology of buildings for public use (e150.3)
Impact	A severe limitation in the Performance of walking and moving around	<ul style="list-style-type: none"> Walking (d450.31) Moving around in different locations (d460.31)
Environment exxx.y exxx+y	A building using Guide 71 [Surface Finish 8.18] can be a complete Environmental Facilitator	<ul style="list-style-type: none"> Design, construction and building products and technology of buildings for public use (e150+4)
Impact	Performance is completely facilitated	<ul style="list-style-type: none"> Walking (d450.01) Moving around in different locations (d4601.01)

NDA

Universal Design

Applications of the ICF in the Field of Design

- Linking ISO 9999 on Assistive Technology to the ICF.
- Linking Guide 71 Human Abilities to ICF (N62)
- Concept specification in the design of:
 - Education (e.g. Swiss National Framework)
 - Emergency services,
 - Architectural products,
 - ICT applications and Computer games,
 - Household products.

NDA

Information Sheet 2 N101

Universal Design



Key Related Resources Identified by the Review

- The Systematized Nomenclature of Medicine - Clinical Terms (SNOMED-CT)
- Assessment of Motor Process Skills (AMPS)
- Handbook for Analyzing Jobs (HAJ)
- Inclusive Design
- 'Design of Everyday Life'
- Matching Person and Technology (MPT)

NDA

Universal Design



Recommendations arising from the International Review

- An approach should be created for integrating appropriate ICF codes into existing design guidance definitions and concepts and to inform future design guidance standards development.
- Appropriate related resources should be used in conjunction with the ICF to provide a systematic, clearly specified and linguistically consistent framework and terminology to enhance design guidance standards.

NDA

Universal Design



Recommendations arising from the International Review contd.

- The use of the ICF in developing design guidance standards needs to be augmented in terms of the specification of:
 - Personal factors;
 - Environmental factors;
 - Person-task and person-object interactions;
 - Anthropometric characteristics.

NDA

Universal Design



Recommendations arising from the International Review contd.

- Linking rules, such as those developed by Cieza et al (2005), should be used to identify appropriate equivalences between current terms and the codes and definitions of the ICF.
- Consideration should be given to the production of a short list of the ICF codes which are most relevant to the domain of design guidance standards.

NDA

Universal Design



A Selection of ISO/IEC Terms Referring to ICF (Seeing Functions) b210

Visual Abilities	ISO -20282-1:2006(7.3.4): Ease of operation of everyday products — Part 1: Design requirements for context of use and user characteristics;
	ISO 26800:2011(E) (Annex B): Ergonomics — General approach, principles and concepts;
Sight	ISO 21542:2011(B.3.1): Building construction -- Accessibility and usability of the built environment;
Seeing	ISO/IEC Guide 71:2001(9.2.1): Guidelines for standards developers to address the needs of older persons and persons with disabilities;
Sight Skills	IEC/TR 62678: Audio, video and multimedia systems and equipment activities and considerations related to accessibility and usability;
Low Vision	ISO/IEC 24751-3:2008(E): Information technology — Individualized adaptability and accessibility in learning, education and training - Part 3: Access for all digital resource description Technologies.

NDA

Information Sheet 2 N101

Universal Design



Key ICF Linking Rules

1. A prerequisite for accurate and appropriate linking is a good working knowledge of the ICF.
2. A term and its related concept should be linked to the most precise ICF category.
3. Where no corresponding ICF code is found do not use the so-called “other specified” ICF categories but document the additional information.

Cieza (2005)



Information Sheet 2 N101

Universal Design



Key ICF Linking Rules contd.

9. The original domain term and the matching ICF code(s) should be recorded together in the resultant documentation produced by the mapping process.

The terms recorded should include:

<Source Term > Source Reference & (ICF Term) ICF-Code:

<Balance > 9.2.5 & (Vestibular Functions) b235:

12. When the ICF cannot provide an appropriate code, alternates from other sources should be sought.



Information Sheet 2 N101

Universal Design



Example of Application of the Linking Rules to mapping the ICF to Guide 71 (2001) Human Abilities

Person	
G71 <Seeing> 9.2.1	& ICF (Seeing Functions) b210:
G71<Dexterity> 9.3.1 G71<Manipulation> 9.3.1	ICF (Mobility of Joint Functions) b710 &
	& ICF (Mobility of Bone Functions) b720 &
	ICF (Muscle Power Functions) b730:
G71<Respiratory Allergies> 9.5.4	ICF (Immunological System Functions) b435 &
	& ICF (Respiration Functions) b440 &
	ICF (Respiratory Muscles Functions) b445:



Information Sheet 2 N101

Universal Design



Linking ICF and Related Resources to Activity and the Environment

Activity	
<Shopping with a Credit Card>	& ICF (Shopping) d2600 &
	& SMOMED-CT [Using a Credit Card] Code: 441830018, Concept: 300709005:
Environment	
<Well lit reception room>	& ICF (Light quality in a space) e2401 &
	& SNOMED-CT [Reception room] Code: 224690008:

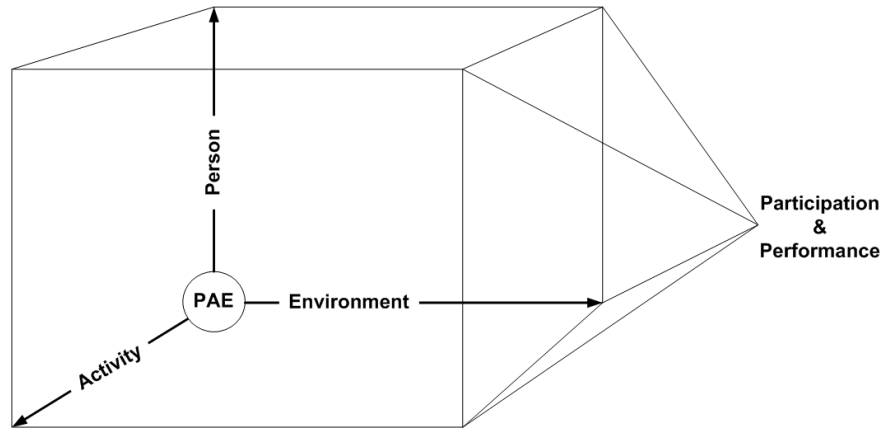


Information Sheet 2 N101

Universal Design



The interrelationship of Person, Activity and Environment (PAE) in standards development



NDA

Universal Design



Main Conclusion

The ICF can transform and systematise the representation of the key components of Person, Activity and Environment (PAE) in standards development

NDA

Universal Design

