What are service providers' perceptions about the use and need of assistive technology by people in Ireland with intellectual disability in the context of providing a person centered service?

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Summary

In Ireland, more than 85% of the people with intellectual disability are supported by voluntary organisations. As part of support services, assistive technology (AT) is often being used by service providers to promote and enhance the independence of people with intellectual disability as well as cutting care cost. Followed extensive literature review, an online survey instrument was developed to investigate service providers' perceptions about the use and need of assistive technology by people in Ireland with intellectual disability in the context of providing a person centered service. The email invitations were sent to 62 intellectual disability service providers in Ireland. A total of 50 service providers completed the online survey. In general, the results of this research shows that the majority of the service providers believed using assistive technology can promote the independence of people with intellectual disability through various aspects including living, employment, community integration, education, communication and socialisation. However the lack of information about needed assistive technology for people with intellectual disability which has already been identified through previous studies has still proved to be one of the major issues. High cost, lack of skilled professionals to make good recommendations, lack of funding are the top three barriers identified through the research and there are no simple solutions to overcome those barriers. The majority of the respondents agreed that AT reutilization program, AT lending program and AT demonstration centre could promote the usage of assistive technology by people with intellectual disability. Among those three programmes, AT demonstration centre is the most important. Through this research, it has been indicated that there are still major issues for service providers in regards to receive adequate and necessary training and education about assistive technology in order to support people with intellectual disability to fully utilising their potential ability and be socially inclusive. The use of online newsletter and information website can improve assistive technology information availability and sharing thus to increase the usage of assistive technology by people with intellectual disability. Recommendations were made on the basis of the findings from this research.

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Abbreviations

ADLs - Activities of Daily Living

AT – Assistive Technology

CRC – the Central Remedial Clinic

FEDVOL - National Federation of Voluntary Bodies

FINDS survey – Family and Individual Needs for Disability Supports Survey

HAAT - Human Activity Assistive Technology Model

HIQA - Health Information and Quality Authority

ICF - International Classification of Functioning, Disability and Health

ID - Intellectual Disability

MDDS - A Method for Dependable Domestic Systems

MDT - Multidisciplinary team

MPT - Matching Person to Technology

NDA- National Disability Authority

NIDD - The National Intellectual Disability Database

PCP – Person Centered Plan

PCS – Person Centered Service

QOL – Quality of Life

RSI - Repetitive Stress Injury

WRULD - Work-Related Upper Limb Disorder

1 Introduction

1.1 Overview

There has been a major shift in how supporting services are provided to people with intellectual disability in Ireland. Historically, people with intellectual disability have been placed either in psychiatric hospitals or were living in large institutional settings. In the past decade, more and more service providers have placed more emphasizes in providing more socially inclusive supported living schemes to people with intellectual disability (McConkey, Abbott et al. 2007). The provision of providing high quality, person centred services (PCS) emphasized that people with intellectual disability have the right to live full and active lives, and be active participants in their own communities (FEDVOL 2011). Person centred service is made up of a set of values, principles, attitudes and approaches to services for people with intellectual disability, and has been recognized as the "best practice" model in intellectual disability sector (Cambridge and Carnaby 2005). During last two decades, many service providers which provide support services to people with intellectual disability in developed countries including the United States, Australia and UK have already been successful in using PCS as a service delivery model (Mansell and Brown 2004), and it has been widely adapted by intellectual disability service providers in Ireland. Some of the service providers referred it as person centred plan (PCP), as it is the philosophy that underpins the practice of all the supporting services provided to people with intellectual disability.

However, the service providers are facing increasing challenges to provide better quality of care for the people with intellectual disability while reducing health care costs at same time. The increasing demands for the service providers to provide higher quality of services while in the meantime the reduction of funding, cutting of budgets and the need to reduce staffing levels has led to an increased demand for the need of assistive technology. Evidence shows that proper usage of assistive technology could promote independent living and effective communication, but without systematic and continuous assessment of the person's needs, assistive technology can be under used or rejected by the users (Lewis 1998; Wehmeyer 1998; Strydom, Romeo et al. 2010). Hence, the requirements for intellectual disability service providers in Ireland to be accountable to the public and to achieve Health Information and Quality Authority (HIQA) standards has led to an increase demands in effective evaluation of the use

and need of assistive technology to improve quality of life of people with intellectual disability in the scope of providing person centred services.

1.2 Aim

This research was conducted to examine and evaluate the service providers' perceptions about the use and need of assistive technology by people in Ireland with intellectual disability in the context of person centred service. It provides an overview of assistive technology and how it relates to the human characteristics of people with intellectual disability and their special requirements for the assistive technology based on review of literature; an online survey instrument was developed based on existing literature to evaluate the need and use of assistive technology by people with intellectual disability from service providers' perspective. The first aim of research is to utilize its findings as a baseline measure for future comparisons; the second aim is to identify what type of assistive technology information the service providers needed in order to provide high quality support services; the third aim is to identify the areas which need to be improved, what are the barriers service providers are facing in order to support people with intellectual disability in the provision of person centred service. Recommendations were made based on findings from the research.

1.3 Background

Support services for people with intellectual disability have a long history in Ireland. Traditionally religious charity organizations such as Sisters of Charity of Jesus and Mary, Brothers of Charity and St. Christopher's Service are the main intellectual disability service providers. People with intellectual disability were living in the large institutional settings or been treated as psychiatric patients. In recent years, the majority of the organizations which provide services to people with intellectual disability are voluntary and state-sponsored; emphasis of services has been transformed or is in the process of transformation from institutional/residential services to person centered services. People with intellectual disability are moved from dormitory type of institutional placement to community/home living environment, more and more people with intellectual disability are living from family home and attending individualised day services on a daily bases, those changes has provided a better quality of life. Assistive technology can play as a key element in person centered planning and be used as a means of increasing independency and providing a better socially inclusive life style to the people with intellectual disability (Sheerin and McConkey 2008).

The economic downturn in recent years plus cuts in funding from HSE and other sources has had a major impact in relation to how service providers deliver support services to the people with intellectual disability. It is a huge challenge to the service providers to use limited resources, time and budgets but are still able to maintain high quality services. Although research has already proved that assistive technology has been used and continuous been used as a powerful tool to provide high quality services to meet the needs of people with intellectual disability in many cases, the potential benefits of using assistive technology has been widely recognized in the UK, United States, Australia and other developed countries, but there are still arguments and questions about the effectiveness of current approaches, for example, some of the assistive technologies have been designed and developed with minimal user-group input, which can result in assistive technology be underutilised or in some cases, been rejected (Wehmeyer, Smith et al. 2004).

1.4 Methodology

The research is mainly a quantitative research with elements of qualitative approach. The participants in this study responded to an online survey that was designed to investigate service providers' perception of use and need of assistive technology by people in Ireland with intellectual disability in the context of person centred service. Email invitations were sent to 62 intellectual disability service providers in Ireland to invite them to participate in this survey, a link with unique token were provided in each email. Data was collected two months later. Total 50 completed responses received. Data was analysed by using Limesurvey data analysis function and Microsoft EXCEL to find frequency and percentage of the responses. Also, by the end of the survey, the participants were invited to leave their comments and suggestion, a total of 25 comments was received and this data was assessed from a qualitative approach.

1.5 Dissertation structure

Chapter 2 of the dissertation provides an extensive review of literature from the aspects of overview of assistive technology and how it related to the human characteristics of people with intellectual disability and their special requirements for the assistive technology.

Chapter 3 describes the research methodology and outlines the research approach, procedure, and the design of survey instrument, ethics issues and the research process used.

Chapter 4 consists of findings and results of the survey.

Chapter 5 provides analysis and discussion of findings and related it to wider topics.

Chapter 6 contains the conclusion from this study; it also outlines the recommendations, limitations and future research direction.

References and appendices are followed.

2 Literature Review

2.1 Introduction

Technology advance, public awareness and service provision has made assistive technology usage become more and more widely accessible. Issues with regards to assistive technology usage such as assessment, funding, benefits, barriers, device selection and evaluation have been well researched. Numerous articles and other materials that address those issues were identified through E-databases, professional journals, relevant organisations' websites, manufacturers' websites, training materials, yet there are only limited documents addressing the issues about the use and need of assistive technology in particular by the group of people with intellectual disability, the majority of the published articles are researched on a wider user groups including old aged people and people with physical and sensory disabilities. Whilst recognising the relatively small number of papers and projects involving people with intellectual disability, the literature review were conducted in a manner of overview of assistive technology from a general and systematic approach and then related to the human characteristics of people with intellectual disability and their special requirements for the assistive technology. The researcher explored the areas such as benefits and barriers of using assistive technology, assistive technology design, classification and selection, by the end of literature review, some of very few research papers which has emphasized on the use and need of assistive technology by people with intellectual disability were discussed and case studies were also given.

The literature review is organized into the following sections:

- Intellectual disability definition, demographic and population in Ireland
- Definition of assistive technology; High tech, low tech assistive devices and examples
- User characteristics associated with intellectual disability and their impact on the use of assistive technology
- Assistive technology and its impact on person centred service
- Benefits of using assistive technology
- Classification of assistive technology, examples also given about its usage in different functioning areas.
- Barriers towards effective use of assistive technology

- Universal design vs. person centred design, the main models which are associated with assistive technology design
- International experiences of the use and need of assistive technology by people with intellectual disability and case studies

2.2 Assistive technology and intellectual disability

2.2.1 Intellectual disability definition

Intellectual disability is formerly known as "learning disability", "mental retardation", "developmental disability", and "mental handicapped". The American Association on Intellectual and Developmental Disabilities (AAIDD) defines Intellectual disability as *"a disability characterized by significant limitations both in intellectual functioning and in adaptive behaviour, which covers many everyday social and practical skills"* (Schalock, Borthwick-Duffy et al. 2010). This disability originates before the age of 18. The major criteria includes IQ < 75, limitations in adaptive behaviour which comprises of conceptual skills, social skills and practical skills, it also take in to considerations such as the community environment, linguistic diversity and cultural differences (Schalock, Borthwick-Duffy et al. 2010). In Australia the Disability Act 2006 defined intellectual disability is *"in relation to a person over the age of five years means a significant sub-average general intellectual functioning existing concurrently with deficits in adaptive behaviour and each of which became manifest before the age of 18 years"* (Australia Government 2006). According to WHO, *¨Intellectual disability means a significantly reduced ability to understand new or complex information and to learn and apply new skills (impaired intelligence). This results in a reduced ability to cope independently (impaired social functioning), and begins before adulthood, with a lasting effect on development¨* (WHO 2010).

According to the World Health Organization, estimated 200 million or more than 3% of the world population have intellectual disabilities; Intellectual disability is ranked as the highest disability population in the world. In Ireland, more than 26,000 people were registered on the National Intellectual Disability Database (NIDD), which representing 0.6% of total population (Kelly, Craig et al. 2010). It is also noticeable from NIDD statistics that the population of people with intellectual disability is steady increasing; this may mainly due to improved healthcare and falling mortality rate as people with intellectual disability are living longer (McConkey et al., 2007).

2.2.2 Assistive technology definition

According to Individuals with Disabilities Education Act, 1990 from United States, assistive technology is defined as *"any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability."* (IDEA 1990). Lewis (1998) describes assistive technology *"as any technology that can enhance the performance of persons with disabilities by augmenting an individual's strengths or providing an alternative mode of performing a task to compensate for the effects of a disability".*

In both definitions, assistive technology are referred to as a broad concept, in general, it refers to any device or service that is designed to promote the independent of people with disability. There are other definitions of assistive technology in which assistive technology is defined in a much narrow field; for example, assistive technologies are sometimes defined as devices and systems that assist learning in the education sector. For the purposes of this research, the broad concept of assistive technology which is more widely acceptable will be used as the definition.

Assistive technology devices range from simple designed low tech equipment to complicated high tech equipment. High tech devices are using electronics or computers as solutions, such as speech recognition software, digital hearing aids, talking calculators, iPhone, and iPad; in contrast, low tech devices are less costly, do not require computer or electronics to operate and easy to obtain, examples are highlighting pens, grab rails, adapted eating utensils, pencil grips, splints and picture sequence board (Ahmed 2010).

2.2.3 User characteristics associated with intellectual disability that impact technology use

One of the main issues which stops people with intellectual disability fully utilize assistive technology is that people with intellectual disability have different levels and forms of cognitive impairments, the main stream technologies may be too complex for some people with intellectual disability to use, for example, a memory aid device which requires strong problem solving skills may be consider too difficult for some individual users; people with autism spectrum conditions are reported to do well when assisted with visual learning devices together with object cues, but not on the own; people with attention deficit difficulties require an assis-

tive technology to help them to overcome their short concentration cycle (LoPresti, Mihailidis et al. 2004).

There is a number of issues influence how assistive technology intervene the users with intellectual disability. Those issues include:

1. Technological considerations: This will be discussed in the next few sections.

2. Cognitive ability

   Cognitive ability, in simple words, means people's ability to understand the world. The below paragraphs will discuss the factors that affect person's cognitive ability and examples are given about how assistive technology can impact in each domain.

   i) Attention: Attention refers to the cognitive process which individual can selectively focus on one particular part of the environment or concentrate on the contents of thinking without disturbance. Attention disorders can be due to various reasons, congenital, brain injury or attention deficit hyperactivity disorder (ADHD), etc. some of the common assistive technologies that can be used to improve attention span and help to concentrate are highlight markers, electronic organizers and software for organising tasks.
   ii) Visual perception: People with intellectual disability may have problems to perceive information visually i.e. recognising objects, processing sequencing of visual objects. Assistive technology can improve visual perception through two different ways: a) substitute the information input to other means such as audio or tactile. B) Adjust the appearance of information. Some of the common assistive technologies examples are magnifier, text-to-speech software and alternative keyboard.
   iii) Auditory Perception: Similar to visual perception difficulties, people with intellectual disability may also have problem to perceive information auditory. This can cause problems such as trying to concentrate on one particular voice while cutting down on the background noise. Some of the common solutions are either to intensify sound or replace it with other input methods such as visual input. Examples of assistive technologies that can be used in this area are phone amplifier, sign language interpreter and hearing aid.

iv) Memory: Will the person seek an object that has been hidden from view? Does the person remember a familiar face? People with intellectual disability are more common to have difficulties with the immediate memory, which means the difficulty to absorbed temporary received information. Some of the common assistive technology solutions are use visual aid while providing object cues, electronic organizers and software for concept development.

v) Understanding: this is the process of interpret, organize, sequent or relating the perceived information into concept. Examples are software for manipulating objects, software for outlining of ideas and electronic dictionary.

vi) Concept of time: this refers to the difficulties such as understanding sequence of the tasks, ability to use a watch, calendar or diary, and understanding request to wait. Examples of assistive technology that may help people with difficulty of time concepts are talking clocks, voice output reminder and time management aids.

vii) Concept of number: People with intellectual disability may have poor number concepts, this refers to difficulties of learning, memorizing and understanding math. Examples of assistive technology solutions are calculator, electronic measuring devices and software with computation cues.

viii) Performance: Does the person initiate tasks? Can the person match pictures with objects? Can the person put words together and write it down? People with intellectual disability may have difficulties to perform tasks. Examples of assistive technology usage in this area are word processing software with writing support, computer-aided system that providing pictorial task instructions and verbal instruction system.

ix) Problem solving: it is refers to the mental processing that requires the skills of problem finding and shaping. People with intellectual disability may have difficulties in generate an alternative course of action, compare two different courses of action or plan and implement a task that has a number of components. Examples of assistive technology tools to help with problem solving skills are graphic organizer, talking word processors and instructional software.

(Wehmeyer, Smith et al. 2004; Atstar.org 2007)).

3. Health issues: In addition to cognitive impairment, people with assistive technology also has higher rate of long term health problems such as epilepsy, dental problems, eating disorders and coeliac diseases. Some may experience psychiatric difficulties.

4. Physical and sensory disabilities: A lot people with intellectual disability also have physical and sensory disabilities such as vision, hearing, tactile sense, fine motor control and co-ordination (LoPresti, Mihailidis et al. 2004). Those problems also add to the need of assistive technology.

5. Social and behavioural issues: Social and behavioural difficulties are often exhibited by people with intellectual disability. Common types of behaviour difficulties are compulsive behaviour, with-drawn behaviour, non-compliant behaviour and challenging behaviour. Despite the fact all behaviour communicates a message and are meaningful, due to cognitive impairment, sensory and physical disabilities and other factors, people with intellectual disability may not be able to express their feelings in a normal way. The exhibited problem behaviours are often the means used by people with intellectual disability to express difficult feelings (McClean and Grey 2008). Although there is no specific assistive technology designed to solve a person with behaviour difficulties, assistive technology may be useful by resolving underlying factors which caused behaviour difficulties. Some of the strategies that related to this area are:

    i) Use multi-media material instead of written material
    ii) Choose assistive technology devices or system that with easy instructional component, colourful graphic menu or buttons and interactive features if possible
    iii) Choose computer games without aggressive and destructive contents
    iv) Use assistive technology to monitor, recording behaviour and drawing progress chart
    v) If assistive technology were been used as reinforce, use it to praise good behaviour.
    vi) Use virtual reality technology to help individual to learn and practice social skills (Special Needs Technology Assessment Resource Support Team 1996).

2.2.4 Assistive technology and person centred service

As cited by National Disability Authority (NDA) report "Guidelines on person centred planning in the provision of services for people with disabilities in Ireland" (Rooney, Koornneef et al. 2010), the definition of person centred service is a service which "*is provided, organised and designed around what is important to the service user from his or her perspective.*" According

to these guidelines, all provision of support services to people with disability including people with intellectual disability should be person centred. The provision of moving people with intellectual disability from residential setting to community or own home environment has been widely accepted and actively promoted by intellectual disability service providers. In the community and home environment, the users themselves are both the active participant and recipient of the care in their own living environment, this environmental changes has also changed the type of the services needed and how to deliver such services. The involvement of the service users and their families in the person centred planning process is very essential to the service providers to deliver successful support services. Assistive technology is often been considered in the person centred planning process in order to improve decision making and adjust to the change of environment. Assistive technology is often needed to be specially designed and customized in order to accommodate individual's skills and deficits (LoPresti, Mihailidis et al. 2004). For example, an electrical powered wheelchair can be customized and individually designed to be able to operate by simple words instructions so that a user with both mobility and visual impairment can benefit from this technology by using his/her verbal language skill. As one assistive technology may not fit every user's requirements, each user may require different types of assistive technology at different life stages; the user's requirements to the assistive technology may changes from time to time due to different circumstances. For example, the user may master the current assistive technology device and learned new skills, thus needing more advanced assistive technology to meet his/her particular needs in the future (Mechling 2007).

2.3 Benefits of using assistive technology

Kelker (1997) listed following areas that assistive technology can benefit people with disabilities:

- To perform functions that cannot be achieved previously. For example, speech recognition device can allow a person with speaking problem to easily communicate.
- To approximate normal fluency, rate, or standards. For example, an electronic powered wheelchair with wireless control interface can enable a person with mobility problem to go shopping on his own without the assistance from a carer.
- To participate in normal programs or activities. For example, an electronic powered wheelchair can enable a person with mobility problem to access different activities without assistant.

- To perform routine tasks. For example, a picture sequence board can easily reminder a person with memory deficit impairment to perform their daily tasks.
- To concentrate on learning or working. For example, a computer with pre-installed assistive technology program can enable a person to easily learning or working from home.
- Easy access to information. For example, text-to-voice reading software can enable a blind person to access more information.
- To promote social inclusion and support a normal circle of friend. For example, using iPad to access Facebook or Skype can easily help the person to maintain contacts with remote friends.
- Easier access to education. For example, virtual learning software can allow a person to study at home instead of having to go to school.

According to Marcia Scherer (2004), assistive technology can benefit service providers from below areas:

- Achieving better quality of life outcomes for the service users
- Reducing care and staffing costs, provide safer living environments to the service users
- Improving independence and autonomy
- Increasing the choices of services such as more community based services, responsive services
- Better allocation of the resources within an organisation

It is also important to note that although assistive technology can benefits both service providers and individuals from different aspects; this does not make redundant face-to-face care and human contact. Assistive technology can, in many cases, promote person centred care, independent living and better social inclusive. However, the service providers should always bear in mind that the use of assistive technology should never replace human contact; moreover, it should be the enhancement tool to improve human interaction rather than social isolation (Abbott, Brown et al. 2011).

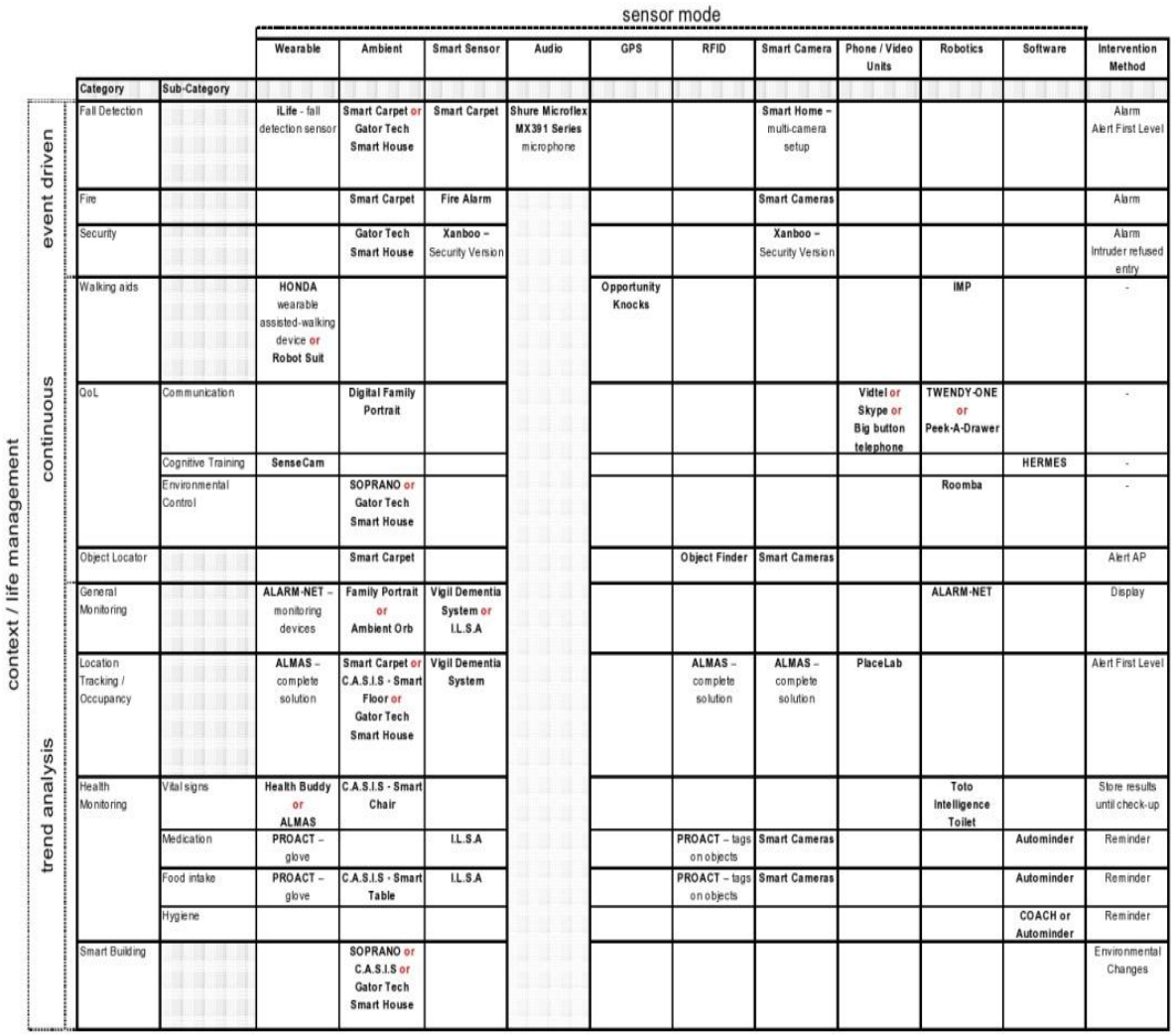
2.4 Classification of assistive technologies

The range of assistive technology devices, services and supports are very extensive. The classification criteria are varied, two widely used classification models are discussed in this section.

2.4.1 Classification by application contexts

O'Brien and Mac Ruairi (2009) classified assistive technology in extended detail from the perspective of different application contexts. Figure 1 illustrates this classification model in a two way dimension table according to the assistive technology device types and archetypical applications, the applications are further classified according to the mode of monitoring and context of usage.

Figure 1 Classification of Assistive Technology Devices and Applications



2.4.2 Classification by functioning

Another typical way to classify assistive technology is using functional measures, by applying International Classification of Functioning, Disability and Health (ICF) (Organisation 2001), quality of life indicators (Petry, Maes et al. 2005) and functional behavioural assessment measures for the people with Intellectual Disability (Tassé 2006), assistive technology can be useful in below areas:

2.4.2.1 Communication

The majority of the people with intellectual disability have the communication problems, either due to physical impairment of the voice organs or cognitive impairment. For example, people with autism spectrum conditions may need prolonged time to respond to a request, they may also need a physical prompt in order to understand the request; some language impaired person often require prolonged time to process speech; some people may have difficulty to understand other person's speech due to the speed of sounds, hence resulting a difficulty to hold a conversation. Augmentative and alternative communication (ACC) is a well-researched area where assistive technology has proved to be useful to the individuals. Assistive technologies such as picture sequence boards, head pointers, digital speech devices provide alternative methods for people with intellectual disability to effectively communicate which cannot be achieved by using talking and writing. One of the applications in this area is software developed by Nagarajan and colleagues (1998), the software functions by translating the conversation into two steps: extending the length of speech sounds and adjusting high frequency and fast speech to louder volume, so to make the speech easier to understand.

2.4.2.2 Mobility

There is no shortage of literature to show how assistive technology can improve the mobility of individuals. Mobility devices such as walkers, wheelchairs and scooters are most common used assistive devices. Mobility problem can affect individual while traveling, at home or at work. Stair lifts, hoists and bath lifts can help people to move around in their own home environment; an electrical powered wheelchair can be designed to be controlled by user through varies human computer interfaces such as joystick controls, wireless controls, head and jaw controls, visual recognition, tongue controls, eye gazing controls and brain controls. Depends on the users' functional disability, the users can choose the most suitable human computer

interfaces to control the wheelchair. Assistive technology can also be used in collision control and direction guiding. For example, Honda's wearable assisted-walking device is designed to help people reduce stress on their knees and climb upstairs (O'Brien and Mac Ruairi 2009); K-Sonar is a mobility aid using ultrasonic echoes to guide the users to avoid obstacles in their environment (Bay Advanced Technologies, 2006).

2.4.2.3 Environmental control and smart homes

Assistive technology can help people with intellectual disability to perform basic daily tasks such as opening and closing doors, switching on and off electrical compliances, operating household devices. Smart homes are homes in which assistive technology has already been installed, the home are set up to be intelligently controlled and easily accessible, some of the main features of a smart home are: window control, automatic lighting, temperature monitoring, medical monitoring and fire alarms. Jones and Doughty (2011) describe how the use of assistive technology has enabled a group of people with intellectual disability including severe challenging behaviour moved to live in community environments in Gwynedd, Wales. They reported the successful usage of several types of smart home technologies such as the WeSpot which is a wireless and non-contacting bed occupancy sensor, the sensor will alert the carer if the resident left bed and failed to return within a set period of time.

2.4.2.4 Activities of daily living (ADLs)

Assistive technology can help people with intellectual disability to perform everyday tasks independently. For example, a wristwatch pager can promote safe and independent meal times of people with rapid eating behaviour; an iPad with video-based instructional program pre-installed can use as a picture cue device to remind the user to understand daily task sequences; a meal time smart table can be used to monitor both food intake and nutritional content (O'Brien and Mac Ruairi 2009).

2.4.2.5 Education

Assistive technology is enabling people with intellectual disability to be able to access main stream education. Devices such as voice recognition system, instructional software and large displayed print are been used in education environment. For example, a team of researchers in Taiwan, China looked at the use of Collaborative Virtual Learning Environment (CVLE) to enhance people with autism spectrum conditions empathy their ability via 3D animated system (Cheng et al., 2010). Another example is HERMES, an assistive technology project which collaborated by six organisations from six countries, one part of this project is providing game-like cognitive learning program to people with cognitive impairment (Buiza et al., 2009).

2.4.2.6 Employment

A range of assistive technology such as large display telephone, literacy support software and screen magnification software are available to support people with intellectual disability at work. One of the examples is the Microsoft's Natural Multimedia Keyboard, a wrist-friendly ergonomic keyboard with shaped surface and split keyboard to make it much more comfortable for typing compare to a normal keyboard, thus can reduce the risks of Repetitive Stress Injury (RSI) and Work-Related Upper Limb Disorder (WRULD) (The Arc 2005).

2.4.2.7 Socialising

People with intellectual disability may experience difficulties in social situations. This could cause by cognitive impairment such as poor coordination/motor function, difficulty of concentration, unorganized and highly impulsive behaviour. Some of the useful assistive technologies are low vision ruler, personal data manager, talking watch and keyfinder. Some of the interactive multimedia learning software are particular helpful to teaching people with intellectual disability to learn social skills (The Arc 2005).

2.4.2.8 Sports and recreation

Assistive technology can help people to participate in sports and leisure activities. For example, modified sports equipment can enable disability user enjoy skiing, boating and cycling; ergonomic handled fork and trowels, short-handled rake can enable a wheelchair user to enjoy gardening (The Arc 2005).

2.5 Barriers of using assistive technology

For a variety of reasons, assistive technology remains largely underutilized by people with intellectual disability in comparison to other assistive technology user groups. There are a number of barriers has been identified, of which, lack of information about the availability and the cost of the assistive technology devices were reported as main barriers for the people with intellectual disability to fully utilize assistive technology (Wehmeyer 1998). Other identified barriers include:

- Complexity of the assistive technology
- Rapid change of assistive technologies
- Lack of assistive technology specialist
- Limited selection of assistive technology
- Lack of funding
- Lack of training

- Limited resources to support effective use of equipment once acquired
- Assistive technology are often too complex to manipulate
- Fragmented government policies
- Limited understanding of resources and service options
- Decision making is complex and involves too much compromises
- Limited funding and support of on-going maintenance and repair of assistive technology

(Anderson, Larson et al. 2011; Carey et al. 2005; Scherer 2004; National Council on Disability 2000)

2.6 Designing assistive technology

2.6.1 Design for all approach

Design for all approach takes into consideration of the user diversity and provides solutions for it through design process. It allows the designed technology can be used by as many users as possible, instead of designing a set of different technologies to suit different user's need (Abbott et al., 2011).

2.6.1.1 Universal design

Universal Design, also known as Design for All or Universal Learning Design *"refers to 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 or disability."* (Disability Act, 2005)

Universal design is aimed

"To maximize the number of [people] who can readily use a product, building or service which may be achieved by:(i) designing products, services and environments that are readily usable by most users without any modification, (ii) by making products or services adaptable to different users (adapting user interfaces), and (iii) by having standardized interfaces to be com1patible with special products for persons with disabilities." (ISO 2008).

This ISO standard is adapted by the European Committee for Standardization (CEN) and National Standards Authority of Ireland (NSAI). Under Disability Act 2005, Centre for Excellence in Universal Design was established in January 2007 in Ireland. As a national guidance, it proposed the social inclusion for the people in Ireland with disabilities including intellectual disa-

bility and enabling those people to interact with environment by using main-stream technologies which are available to the public (Disability Act, 2005). Papanek (1970) pointed out that "*The only important thing about design is how it relates to people".* It highlighted that the design of technology products should consider about using common interfaces that are suitable for all potential users.

Mace (1997) listed 7 Principles of universal design which are listed below; examples of application of those principles are also listed.

Principle 1 Equitable Use: The design is able to be used by people with different level of abilities including people with intellectual disability. For example, people with intellectual disability may need pro-longed time to response to ATM instruction to withdraw money; a good ATM design is not only designed for normal bank users, but also should take consideration of the people with special needs.
Principle 2 Flexibility in Use: For example, a website has pre-stored a wide range of preferences and different texts so can be used by the people with different visual requirements.
Principle 3 Simple and Intuitive Use: Design has to be easily understandable. For example, instructions to people with intellectual disability is written in plain English and illustrated in descriptive figures.
Principle 4 Perceptible Information: Some of the designer may think it is hard to approach a cognitive design, as it is easy to approximate what it is like to be blind (close eye), deaf (block ears), or mobility disabled (restrain hands or legs), but it is not an easy task to find exact match to stimulate the conditions like cognitive impairments.
Principle 5 Tolerance for Error: the design takes into consideration of possible error operations. For example, device will prompt the user to make an alternative choice if wrong button has been pressed.
Principle 6 Low Physical Effort: for example, a good designed website that has sufficient colour contrast in order to minimize eye strain.
Principle 7: Size and Space for Approach and Use: for example the accessing door is wide enough so wheelchair user can pass through.
(Burgstahler 2006)

Even though it is the goal of most technology development efforts to incorporate the principles of universal design, due to the nature of complexity of disabilities, to fully address cogni-

tive access in the design and development of assistive technology is still a long way to go. During the Shared Innovative Learning Seminar: "From the Dinosaur Era to the Digital Age –Using Technology to Support Ordinary Lives", Rice (2011) proposed below recommendations to design applicable assistive technology to people with intellectual disability by applying universal design principles:

- Test: Test and involve people with intellectually disability even from the very early stage of design.
- Pictures: Use lots of images whenever possible. Images are not just decorations; they are the core content of the design. Use icons and symbols to supplement text.
- Choices: Keep the menu choices or buttons simple, and limit how many there are – typically five options is enough for people with intellectual disability.
- Text: Use big text and simple writing. Use simple words, short sentences and short paragraphs.
- Media: Include audio versions of all content, so users can listen to it instead of reading it. Also include video and animation whenever possible.

It has also been noted (Abbott et al., 2011) that although some of the researches which are focus at design and evaluation of one particular technology and target at a wide range of users, the evaluation is only based on the designers' own testing or a small user group. The results of the research is unlikely to be generalizable, more research could be done in those technologies and would be helpful to see in academic papers.

2.6.2 User centred design approach

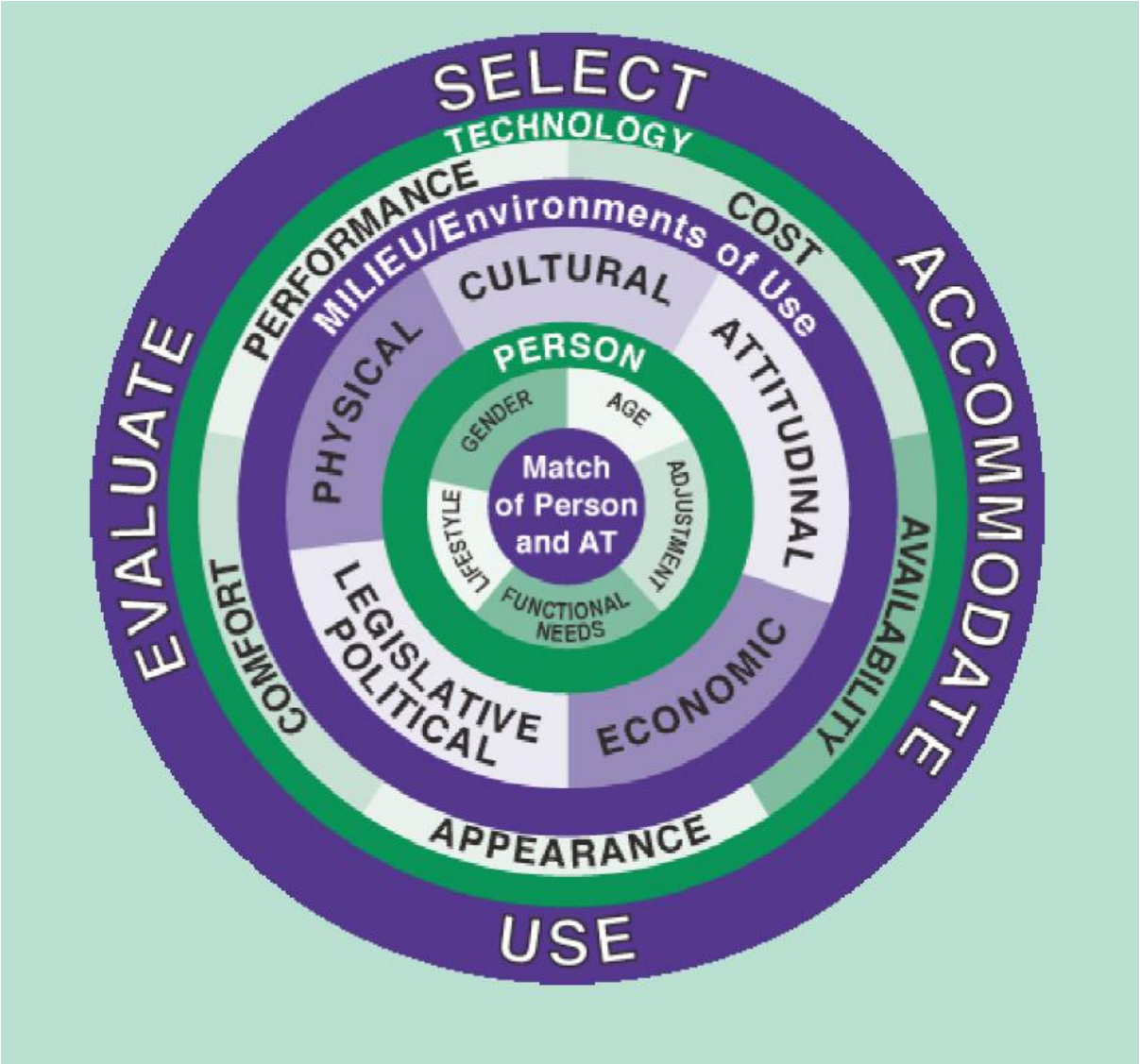
User centred design – sometimes known as person centred design – which addresses the designing process from the focus on user requirements and highlights that technology is useless without the users' involvement. One of the main reason leading to the underutilization of assistive technology is the technology is designed without proper consideration of the users' ability, understanding and expectation, in the worst case scenario, assistive technology can be rejected by the users instead of them benefiting from it. User centred design brings the users, designers, service providers and all other stakeholders together into the design process and takes into consideration of all their needs. The main advantage of this type of design approach is it highlights the issues of usability by take users preferences, needs and requirements into account from the very early stages. There is another important factor that needs to be addressed, in particular, in the intellectual disability sector, is the importance of the role of peo-

ple whom are providing care and support to people with intellectual disability, for example, service provider staff, family members and advocate. Due to intellectual disability and sometimes accompanied with physical disabilities, a lot of people with intellectual disability have communication difficulties and may rely on those supporting personnel to express their feelings, thus interaction with supporting personnel plays an essential part in the design process (Abbott et al., 2011). The following paragraph describes three main assistive technology design and selecting models.

2.6.2.1 Matching Person to Technology (MPT)

As it illustrated in Figure 2 below, developed by Marcia Scherer (2004), this model is a user-driven model, the user is placed in the centre of circles, surrounded by personal preferences, socio-political, social-economic, technological, and cultural elements. This model uses a person centred approach to match the users with the most appropriate technologies. It consists of a series of measures to assess the individuals and technologies from the aspects of environment, user preference, function and features of the technology.

Figure 2 Matching Person to Technology Model (MPT)



Source taken from (Scherer 2004) The matching person and technology model

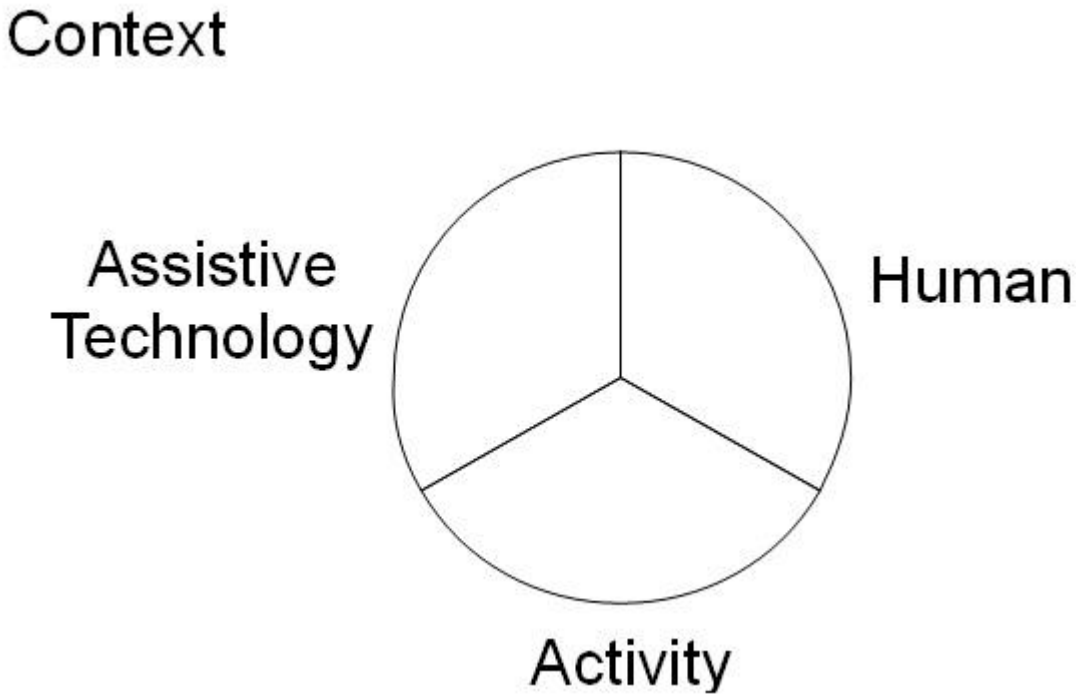
2.6.2.2 Human Activity Assistive Technology Model (HAAT)

The HAAT model is developed by Albert Cook and Susan Hussey (Cook and Polgar, 2008) in order to describe an interrelationship between the individual, the activity and the appropriate assistive technology within a particular context. As seen in Figure 3 below, It takes into consideration of the individual's skill and ability, the activity that the individual is expected to perform, and the context on the activity. The contexts includes setting, social, cultural and physical context which are illustrate in further detail below:

- Setting context is about location and environment
- Social context governs what is considered expected and normal

- Cultural context refers to concepts of common behaviour
- Physical context refers to the environmental features where the system is located

Figure 3 Human, Activity, Assistive Technology Model (HAAT)

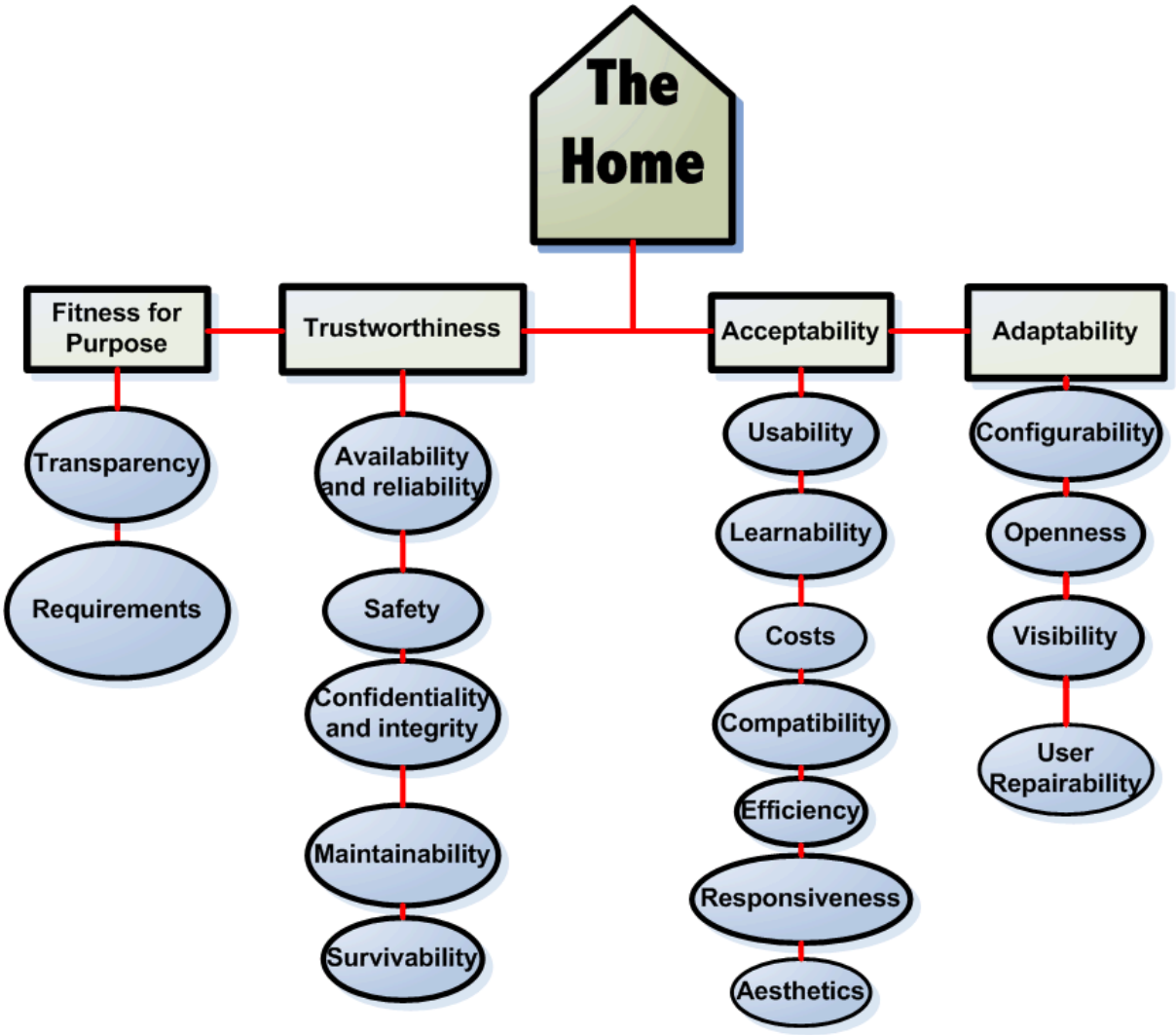


Source taken from (Cook and Polgar, 2008). Cook & Hussey's assistive technologies: principles and practice,

2.6.2.3 A Method for Dependable Domestic Systems (MDDS)

Guy Dewsbury and his colleagues (2003) developed the MDDS Model which is adapted from Jean-Claude Laprie et al's Software Development Model of Dependability to measure the dependability of assistive technology. This model uses technology dependability as the core element to assess technology against four distinct criteria: Acceptability, trustworthiness, adaptability and fitness for purpose in the design or selecting process. The model consists of a set of questionnaires and forms which can be used to assess the individual's relationship to the specific technology or overall system from a person centred approach, see Figure 4 below.

Figure 4 The Dependability Model for Domestic Assistive Systems



Source taken from (Dewsbury, Sommerville et al. 2003) A dependability model for domestic systems

2.7 International experiences

In this section, the researcher explored international academic papers that documented the use and need of assistive technology by people with intellectual disability, and some other academic papers which investigated the usage of assistive technology by wider user groups, in particular, people with disabilities but had some emphasis on people with intellectual disability in the studies. The following section summaries a selection of the content from these studies and followed by two case studies with latest developments and usage of assistive technology by people with intellectual disability.

2.7.1 Anderson, Larson et al. (2011)

Conducted by The Arc, the Family and Individual Needs for Disability Supports (FINDS) survey is aimed to obtain perceptions of people with intellectual disability and their families' need for disability support in the United States. Around 5,000 family caregivers and 558 people with intellectual disability responded to the survey. Report shows that 35% family caregivers reported the need for assistive technology but could not get it; the most needed assistive technologies were computer/software, exercise equipment, picture communication software, smart home technology and audio books. With regard to the barriers which prevent people with intellectual disability from getting needed assistive technology, 67% respondents identified too expensive as the main barrier, followed by 16% responses insurance declining, 16% responses never trying to get it and 10% responses that not knowing where to get it.

2.7.2 Mechling (2007)

The author reviewed the literature from 1990 to 2005 on use of assistive technology as a self-management tool to promote the independence of people with intellectual disability. Total 40 investigations have been reviewed; those investigations have studied the use of assistive technology by people with intellectual disability in various functional areas. All these investigations have reported positive results that assistive technology can benefit people with intellectual disability. Research has also raised question that how to best use assistive technology and how can it be improved.

2.7.3 Carlson and Ehrlich (2005)

This official United States government paper reported the findings from the "Survey of Assistive Technology and Information Technology Use and Need by Persons with Disabilities in the United States, 2001". This survey was conducted through a nine months period. More than 1,400 people with disability and their family members were selected and asked questions about assistive technology and information technology use and need in the contexts of at home, at school, at work, and in the community. More than 90% respondents completed survey. Results show that more than 50% respondents have experiences of using assistive technologies. More than 30% respondents indicated their need for assistive technology that they did not have. The report also examined people's perception about the availability and usefulness of assistive technologies. Lack of information, assistance, and high cost were identified as the main barriers.

2.7.4 Carey et al. (2005)

A survey of 83 adults with intellectual disabilities by Carey and her colleagues examined factors affecting use of computer, internet, and electronic organizers. 42% of participants used computer, 25% of participants used internet and 11% participants used electronic organizers. The usage was influenced by the factors such as age, work setting, and self-perceived ability. Main barriers which were identified by participants are lack of access, lack of training and support, and high costs. The participants showed a lot of interest in using assistive technology.

2.7.5 Wehmeyer (1998)

The author examined the use of assistive technology from use-specific areas which consisted of mobility, hearing and vision, communication, home adaptation, environmental control, independent living and computer usage. More than 1,800 family members of The Arc, a United Sates National organisation on intellectual disability registration participated in the survey. Results show that assistive technology is underutilized by people with intellectual disability. The primary barriers identified by this survey were the lack of the information about the availability and the high costs of assistive technologies. In many cases, people are unaware of the potential benefits that they can gain by using assistive technologies. The author concluded that there was a need to create more resources of funding to purchase the assistive technologies and it is necessary to apply universal design to the technologies.

2.7.6 Mendelson, Heller et al. (1995)

This study shows the results of assistive technology usage of 268 people with developmental disabilities in Illinois, United SatesA. Total 70% of the nursing home residents and 55% community residents are in use of assistive technologies. 85% of people with mobility problems used assistive technologies mainly wheelchairs to assist with mobility; 6% of people with problems to access ADLs used assistive technologies; The percentage of utilising assistive technologies falls to 4% for people with communication impairments.

2.8 Case Studies

2.8.1 The Smart Living Project (O'Donnell 2011)

Information on the Smart Living Project is obtained during FEDVOL master class learning seminar 6: “From the Dinosaur Era to the Digital Age – Using Technology to Support Ordinary Lives”. A brief history of this project is given below:

The Smart Living Project is a pioneer project launched by Brothers of Charity Services, Galway branch to utilize currently available assistive technology to enable people with intellectual disability to be able to live independently in the community environments. The project is funded by Department of Environment. During the initial phase, 6 male residential residents whom have profound medium or severe intellectual disability and due to move into a six one bedroom apartments in County Galway were chosen for this project. Unhappy in residential accommodation, lack of privacy, limited independence and limited space for intimacy with family and friends are highlighted common issues which have been identified through their person centred plan. Those six service users also have different levels of potential risks to move to community living: mainly due to their medical conditions, health and safety concerns, coping skills and abilities, and negative attitudes from their parents and friends. Each service users has different capabilities and disabilities and required different types and levels of care. The project team examined different assistive technology providers currently available in Ireland, one of the main assistive technology providers which have the facilities to provide 24/7 monitoring services was chosen to be the technology provider for this project. The assessment of individual service user's needs were conducted, assistive technology provider demonstrated available assistive technologies and provided assistive technology awareness session to the service provider staff. They also undertook site visit to assess individual's requirements, recommendations and advice on most suitable assistive technology solutions were made based on individual service user's needs. Assistive technology usage training was also provided to the service provider staff and the service users. Based on individual service users' person centred plan, the assistive technologies which were used in this project were carefully selected and tailored to meet the service users' needs. The most suitable assistive technology devices were selected and the installed system has the flexibility to allow additional devices be added or removed when service users' needs changes. Assistive technology devices such as exit alert, fall detector, bed and chair occupancy sensor, burglar alarm, movement detector, epilepsy sensor, smoke alarm, flood detector, pull cord were installed. To date of this report, this project is still in the very early stages of development, the assistive technology provider are currently providing the monitoring service to the community houses, in the future, the monitoring will be provided by care staff from the Brother of Charity Service.

2.8.2 The Aberdeen experience (Dewsbury 2005)

In 2005, a sudden decision was made to move a group of people with intellectual disability in Aberdeen, Scotland to community environments due to immediate hospital closures. Compre-

hensive assessments were completed as part of their person centred plan to support their relocation. Those assessments include:

a) Occupational therapy assessment: this is the assessment of the need for the assistive technology, including how the assistive technology will help to support positive outcomes for the service users.
b) Risk assessment: This is about how appropriate the use of certain assistive technologies would affect people with challenge behaviour, for example, is the devices unbreakable or easy to repair? What is the potential impact of those devices upon their human rights and privacy? and how to manage them?
c) Safety assessment: how to manage challenge behaviour? How to ensure the safety of both the service users and care staff?
d) Responsibility: Who is responsible for monitoring the use of the assistive technology and who is responsible for responding to it?
e) Technical assessment: What can assistive technology achieve? what aspects of their functions would be appropriate to be used?

The requirements of their new home were made based on above assessments. Special requirements to their living environment such as sound proofing, large spacing, easy washable and repairable structures were accommodated. Followed assessments, the building were designed with environmental control system in place such as fire alarm, alert sensors, and security system. Each community house was tailored to the specific requirements of the residents. The assistive technologies which were chosen to use were careful selected and can be easily extended or distended as per requests. Compared to living in a hospital environment being 24 hours monitored. The residents had much more freedom to explore, learn and interact with their own environments. Fewer care staff were needed in the community houses due to the residents no need to be attended all the time. The staff resources were re-deployed in alternative ways to improve the overall quality of care provided. For example, staff had more time to spend to undertake meaningful activities with the service users.

2.9 Summary

The review of literature suggests that although assistive technology is a well-researched topic, with such a wide range of assistive technologies products available and some of them have been in used for many years, little is known about how they are been used by people with intellectual disability. The majority of existing academic papers which focus on research of the

usage of assistive technology are target on the assessment and evaluation of old aged people and people with physical disabilities, very little studies has been carried out about the relationship in between the human characteristics of people with intellectual disability and their special requirements for the assistive technology that best matching their needs. Moreover, many of these studies are research on selection and training of individuals to use a particular assistive technology and evaluation of the efficiency of such a technology. Among those studies, some of the academic papers are written based on the investigations of users whom closely associated with such technology or a small sample group. In particular to the usage of assistive technology to improve cognitive impairments, compared to the amount of papers available about augmentative and alternative communication (AAC), there is still much less research literature on other cognitive impairments. On top of that, many government strategies and public attention has been paid to issues about independent living and social inclusive of old aged people and people with disabilities, again, little attention has been focused on people with intellectual disability.

It has been revealed from literature that while evaluation of assistive technology usage by the users themselves is helpful to examine the factors that affect the effective use of assistive technology, the investigations into a wider group including designer, policy maker, service provider, clinical professional and other stakeholders have equal importance to the understanding of how assistive technology can impact the end users. For example, no matter how well an assistive technology is designed, if the service provider who oversees assistive technology provision are not informed, aware, advocate and trained, the beneficiaries, which in this case, people with intellectual disability, may not be able to fully utilize the assistive technology or never get chance to use it. As a result, how well the service providers are equipped with adequate knowledge about assistive technology is very essential to determine the successful usage of assistive technology by people with intellectual disability (Scherer 2004; Wehmeyer, Smith et al. 2004). Hence the present research was designed to investigate service providers' perceptions of the use and need of assistive technology by people with intellectual disability. It is based on the hypothesis that assistive technologies are generally underutilized and there is a assistive technology information shortage in Ireland, this research focused on the examination of the factors behinds those underutilisation, what we can do to improve assistive technology information sharing and how service providers can provide person centred services in a cost effective way by utilising assistive technology.

3 Methodology

3.1 Introduction

This chapter outlines the research methodology. It includes a detailed description of the research strategy, the procedure, the setting and participants, the approach to the design of survey instrument used for data collection, ethical issues, as well as the data analysis and results.

3.2 Research Methodology

Literature review suggested that there is no universally accepted strategy for measuring the effectiveness usage of assistive technology. As this study is aimed to investigate the use and need of assistive technology by people with intellectual disability from service providers' perspective, a quantitative approach is consider most suitable to achieve a numerical description of a large group of people's attitudes and opinions. The researcher has therefore chosen a format of online survey to collect quantitative data, however elements of qualitative approach were also considered to provide in-depth explanation of participants' choice to the survey questions. At the end of the survey, participants were asked to write down their comments and suggestions, the data was gathered and analysed from qualitative approach to allow the researcher to explore the themes which had not emerged through the other survey questions.

3.3 Participants

One of the challenges the researcher faced in designing this research was how to select participant group. The targeted participants are service providers that provide direct support services to people with intellectual disability in Ireland. There is no explicit information available about how many service providers are available in Ireland and who they are. Initially, the Health Research Board which administrates and maintains the National Intellectual Disability Database (NIDD) were considered as the contact point to retrieve information about the service providers, analyses of their statistics report – "Annual Report of the National Intellectual Disability Database Committee 2009" (Kelly et al., 2010) revealed that although the service provider staff are the primary data collectors to provide the information of people with intellectual disability to the NIDD and ensure data validity, the detailed information about each service provider was not disclosed from the database due to ethical considerations. The researcher then has to consider recruiting participants from other resources. After a number of enquires to different authorities and taken advice from the experts, the researcher decided to

source the participants from the National Federation of Voluntary Bodies (FEDVOL). FEDVOL is *"a national umbrella organisation for voluntary/non-statutory agencies who provide direct services to people with intellectual disability in Ireland"* (FEDVOL 2011). It consists of 62 member organisations and provides direct support services to more than 22,000 people with intellectual disability in Ireland which means it covers more than 85% of the intellectual disability population in Ireland (FEDVOL 2011). Email contact list of those 62 service providers were obtained from FEDVOL website on find a service section.

The second challenge is who the audiences are. In traditional opinion, technologies related issues are generally addressed to the IT department within organisation. Assistive technology functions are not the same as the IT function as it involved a wider range of stakeholders participation to make it achievable. The provision of using assistive technology is part of the provision of providing person centred service hence it is part of the organisational strategies. Due to the above reasons, the researcher decided in order to serve the purpose of this research, the target audience should be the management team whom are responsible to oversee the organisational operation and provision of services.

3.4 Procedure

The participants in this study responded to an online survey that was designed by using the Limesurvey, an open source survey tool. The invitation emails were sent to the management team of 62 FEDVOL member organisations. A link with a unique token is provided in each email, service provider was requested to complete the survey. A reminder email is send if no response received within two weeks followed by a second reminder email in another two weeks' time. No further reminder emails were sent. The participants were asked to complete the survey by clicking on the link, complete the survey, and then anonymously submitting it. After the surveys were submitted, the data were stored in a MYSQL database. The statistics were generated by using Limesurvey data analysis function and Microsoft EXCEL. Majority of the participants completed survey within two weeks after receiving of invitation email. One service provider replied that they didn't wish to participate in the survey. A total of 54 responses were received, of which 50 were completed responses. The data presented here reflects the analysis of 50 completed responses.

3.5 Survey Instrument

3.5.1 Design of survey Instrument

An extensive literature review was conducted by the researcher to identify survey instruments which can be adapted for the purpose of this research. Though no up-to-date measures were reported or specified enough for examine the use and need of assistive technology by people with intellectual disability from the service providers' perspectives, based on the existing literature on assistive technology, some of previous survey instruments including those are targeted at wider response groups including older aged people, people with disabilities, their families and care givers are taken into consideration. Table 1 below presents a brief description of those survey instruments.

Table 1 Descriptive Characteristics of Survey Instruments

Author(s)	Name of Survey Instrument	Type of survey	Respondent	Number of Respondents in Study
(Ahmed 2010)	Perceptions of using assistive technology for students with disabilities in the classroom	Online survey	Students and staff members from a Midwestern University	28
(Massachusetts Rehabilitation Commission 2006)	Survey of assistive technology users' needs in Massachusetts	Online survey and printed version	AT users and their family, people work with AT user	422
(Carlson and Ehrlich 2005)	The 2001 survey of assistive technology and information technology use and need by persons with disabilities in the United States	United States, nationwide telephone interview	People with disability	1414
(Wehmeyer 1998)	National survey of the use of assistive technology by adults with mental retardation	Questionnaire send by post	Family members of adults with mental retardation from The Arc	1,218

Based on those instrument tools, the researcher developed a pilot-version of survey instrument. The researcher decided to choose online survey as the survey delivery means due to its distinctive advantages: fast, convenience, economic and easy to reach target audience. Different online survey applications have been tested such as Survey Monkey, Google Forms, SurveyGizmo and Limesurvey. The researcher decided to use Limesurvey as the survey tool for this research due to its powerful, flexibility, strong community support and the main feature: completely free. Limesurvey software was downloaded and installed on a hosting website; a MYSQL database was created to store the survey responses. The pilot survey instrument was emailed to a small focus group from the researcher's place of work, a large FEDVOL member organisation which provides residential, community and day service to people with intellectual disability for discussion and evaluation. The focus group consisted of GP, psychiatrist, nurse, care staff, speech and language therapies, physiotherapist, occupational therapist and management team of the organisation. During the pilot study, the research informally interviewed participants; the views are from very different perspectives and covered a wide range of topics as the participants in this pilot survey are professionals from different disciplines. The feedback mainly focus on expectation and knowledge about using assistive technology, perceived understanding of assistive technology training opportunities, current Irish market and available products which can be useful in various functional impairments. The feedback and suggestions were used to revise the survey.

3.5.2 Survey components

The final survey consists of 4 sections and totalling 18 questions. In section 1, the respondents were asked to indicate whether they agreed that assistive technology can promote the independent of people with intellectual disability from living, working, participating in the community, learning, communicating and socialising totalling six domains; secondly, the respondents were asked about their knowledge of assistive technology from different aspects; Thirdly, they were asked about to rate the quality of assistive technology information they received; in the last of this section is a multiple choice question, the respondents were asked to identify the barriers they faced in getting the appropriate assistive technology for people with intellectual disability, if the barrier is not listed in the option list, respondents also had the choice to write down other barriers.

Section 2 assessed respondents' opinions and attitudes about three different assistive technology programs, AT reutilization program, AT lending program and AT demonstration centre; furthermore, the respondents were asked to rank these three assistive technology programs in order of importance.

Section 3 covered education and training of assistive technology, it also assess the respondents' opinions and attitudes about using internet, in particular online newsletter and information website to promote the use assistive technology by people with intellectual disability. Section 4 which is the last section is an open question, the respondents were asked to write down if there were any extra recommendations or comments they would like to make about how we can better meet the assistive technology needs of people with intellectual disability in Ireland.

The printable version of survey is contained in the Appendix B

3.6 Ethics Issues

As outlined in Trinity College Research Ethics Protocol that any studies involving human subjects has to seek ethical approval, the approval of this research has received from School of Computer Science and Statistics Research Ethical Committee, Trinity College prior to the survey commencement.

There was no obligations for participation in this survey. A statement of agreement/consent and research information page is provided in the email and front page of the online survey. In the statement, it is requested that the participants have to be over 18-years-old in order to complete the survey. The statement of agreement also informed participants that their participation is voluntary and they may withdraw at any time and for any reason without penalty. There is a link provided for the participants to exit the survey at any time during the survey, also, participants had the option to choose to save the partially completed survey and resume it later. By clicking the "Next" button on the front page, the participants simultaneously consented to participate.

3.7 Data Analysis

The data were first analysis using Limesurvey build-in response assessment and statistics generate function to find out the frequency and percentages of the responses and create illustrat-

ing charts. The responses and statistics then exported into a CSV format file and further analysed by using Microsoft EXCEL.

The last question to this survey is an open-ended question which gives participants the freedom to voice their comments and suggestions. Total 25 participants were commented to this survey and data were assessed from a qualitative approach. Data were extracted from MYSQL database and saved in a Word document format. The analysis began with repeated reading of those comments so the researcher can immerse into the data. No analysis software was used here due to data received was relatively small amount. A number of themes were gathered from the data and further literature review were conducted based on those themes to help the researcher to better understand the domains involved in this research.

4 Results

4.1 Introduction

In total 54 responses were received, while 50 were completed responses, 4 were uncompleted. One organisation replied email and expressed they did not wish to participate in the survey. This chapter describes the results of 50 completed responses to the online survey.

4.2 Assistive technology and independence

In regards of six different domains - living, working, participating in the community, learning, communicating and socialising – the majority of the responses received are positive. Table 2 presents the results.

Table 2 Assistive Technology and Independence

Question 1. To what extent do you agree that assistive technology can contributes to the independence of people with intellectual disability?

[Living Independently]

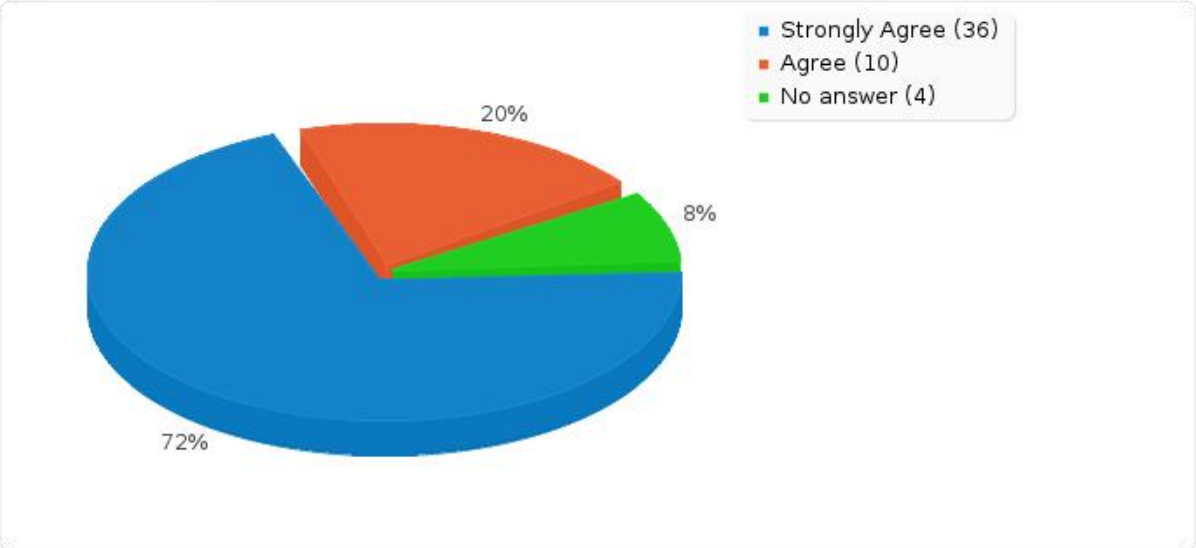
Answer	Count	Percentage
Strongly Agree (2)	38	76.00%
Agree (3)	6	12.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%

[Working]		
Strongly Agree (2)	32	64.00%
Agree (3)	12	24.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%
[Participating in the community]		
Strongly Agree (2)	34	68.00%
Agree (3)	10	20.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%
[Learning (school, general education)]		
Strongly Agree (2)	38	76.00%
Agree (3)	6	12.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%
[Communicating]		
Strongly Agree (2)	38	76.00%
Agree (3)	6	12.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%
[Socialising]		
Strongly Agree (2)	30	60.00%
Agree (3)	14	28.00%
Disagree (4)	0	0.00%
Strongly Disagree (5)	2	4.00%
No answer	4	8.00%

Question 2. To what extent do you agree that assistive technology contributes to the independence of the people with Intellectual Disability?

In general, 46 participants (95%) agree or strongly agree that assistive technology can contribute to the independence of people with intellectual disability, while 4 participants choose not to answer the question. The data from Figure 5 demonstrates the results.

Figure 5 Using Assistive Technology to Promote the Independence



4.3 Assistive technology information quality and availability

The next three questions were asked in order to examine the quality and availability of the assistive technology information the service providers received, in particular relates to the use and need of assistive technology by people with intellectual disability; their awareness of current availability of different type of assistive technologies; their knowledge and experiences of supporting and assisting people with intellectual disability to assess, select and purchase assistive technology; their knowledge of how to provide necessary assistive technology assistance when the users needed. Table 3 below shows the responses received.

Table 3 Information Quality and Availability about Assistive Technology

Question 3. Overall, how much information and advice have you received about assistive technology?

Answer	Count	Percentage
None (1)	0	0.00%
A little (2)	12	24.00%
Some (3)	18	36.00%
A lot (4)	14	28.00%
No answer	6	12.00%

Question 4. Overall, how much information and advice have you received about how to obtain assistive technology devices and services?

Answer	Count	Percentage
None (1)	4	8.00%
A little (2)	14	28.00%

Some (3)	20	40.00%
A lot (4)	8	16.00%
No answer	4	8.00%

Question 5. Was the information you received able to improve the quality of the life of the people you are supporting?

Answer	Count	Percentage
Yes (Y)	38	76.00%
No (N)	6	12.00%
No answer	6	12.00%

Question 3 in Table 3 examined the amount of information and advice the service providers received about assistive technology, it is including any type or format of information and advice they received. As results presented in table 3, the response is varied: 36% of participants response "some", while 28% response "a lot", 12% participant recognize they only received "a little" information about assistive technology, while 6 participants which represents 12% of respondents choose not to answer the question.

Questions 4 in Table 3 examined the amount of information and advice the service providers received about how to obtain assistive technology. The result is differing from the question 3 in the Table 3 and is more negative. 8% of participants response that they had never received any information regarding how to obtain assistive technology, while 28% response "a little".

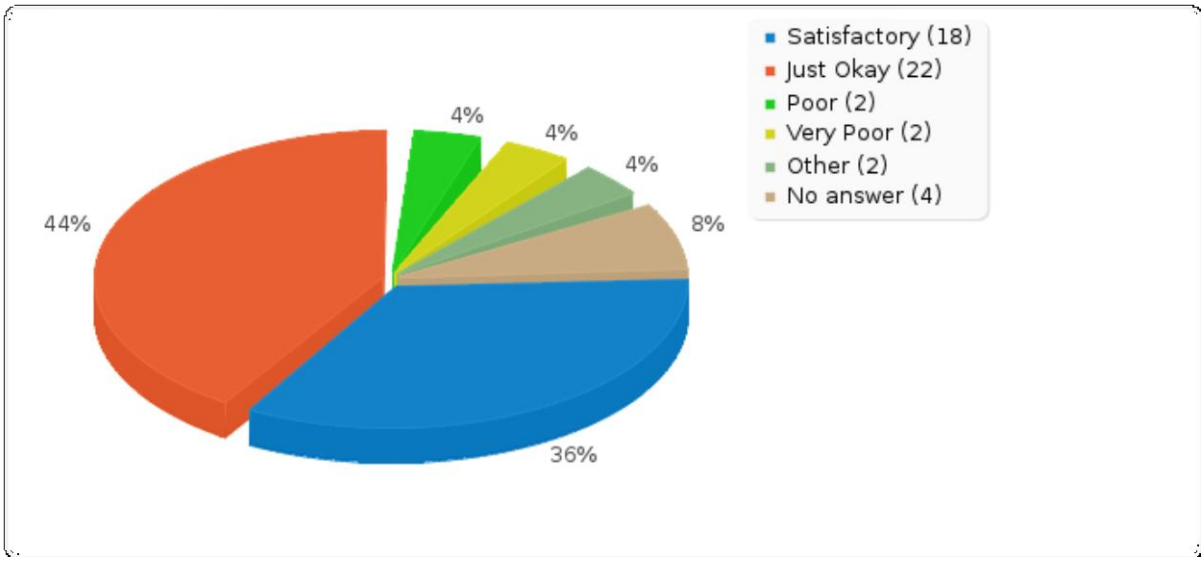
In answering question 5 in the Table 3 "was the information you received able to improve the quality of the life of the people you are supporting?" the result is more positive, 76% participants response "yes", while 12 % response "no", again 6 participants which represent 12% responses choose not to answer the question. In considering the responses from previous two questions, the implication here is, while the participants the opinions of the amount of the information they received about assistive technology in general and how to obtain assistive technology is varied, majority of them agree that the information they received is useful and worthwhile.

Question 6. How would you rate the quality of the information you received about assistive technology?

In relation to the quality of the information received, only 36% participants responded it is "satisfactory", 44% participants thought it is "just okay", 8% rated either "poor" or "very poor",

none of the participants thought the information they received are of outstanding quality. The results are presented in Figure 6 below.

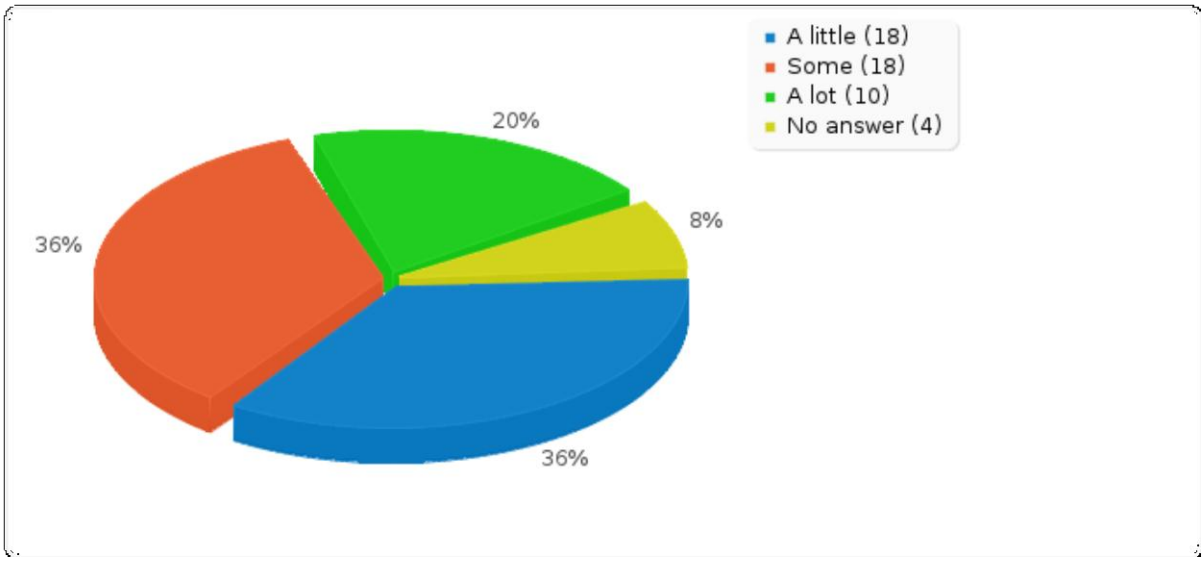
Figure 6 Quality of the Information about Assistive Technology



Question 7. Do you agree with the statement: Compared to 10 years ago, people are more aware of the need for assistive technology devices and services by people with intellectual disability?

In this question, more than half (56%) of the participants responded that people's awareness of the need for assistive technology by people with intellectual disability has increased, see Figure 7 below.

Figure 7 Awareness of Assistive Technology

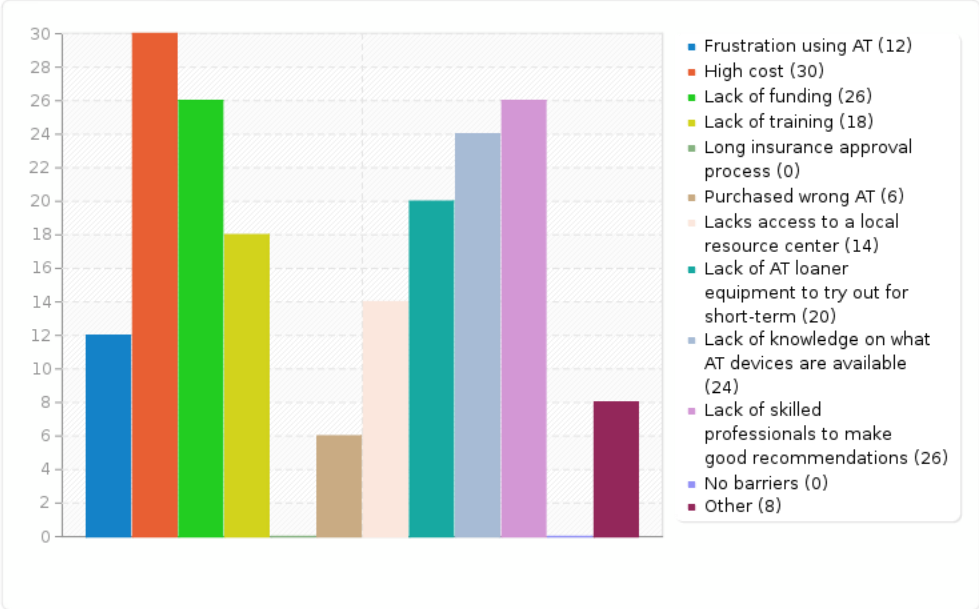


4.4 Barriers to assistive technology usage

Questions 8. What do you think is the biggest barriers that you faced in getting the right assistive technology for the people you are supporting?

Figure 8 below presents the barriers identified by service providers in getting the right assistive technology for the people with intellectual disabilities, response counting and frequency of each given barrier were recorded.

Figure 8 Barriers to assistive technology usage



High cost, Lack of skilled professionals to make good recommendations, Lack of funding are among the top three barriers identified, followed by Lack of knowledge on what assistive technology devices are available, Lack of assistive technology loaning equipment to try out for short-term, Lack of training, lack of access to a local resource centre, frustration using assistive technology, the purchasing wrong and unsuitable assistive technologies. Other barriers which not in the list but identified by the participants are: Faulty attitudes, people with intellectual disability need pre-requisite skills to use some of the assistive technology and lack of time to research what is available.

The high costs and lack of funding are ranked number one and number three barriers; both indicates that financial reasons are the main barriers stopping people with intellectual disability using assistive technology. The number two and number four barriers – lack of skilled professionals to make good recommendations and lack of knowledge on what assistive technology are available is also an indication of lack of information on assistive technology, which is consistent with the results revealed from previous questions in this survey.

4.5 Assistive technology usage programs

This section explored participants' attitudes and opinions towards three different assistive technology usage programs, namely, AT reutilization program, AT lending program and AT demonstration centre. The results are overwhelmingly positive; more than 80% participants agree that those programs would be both helpful and beneficial in Ireland, see Table 4.

Table 4 Assistive Technology Usage Programs

Question 9. In your opinion, would an assistive technology Reutilization Program - that allows one to swap, repair, recycle, or otherwise re-use various second-hand AT devices - be helpful in Ireland?

Answer	Count	Percentage
Yes (Y)	40	80.00%
No (N)	2	4.00%
No answer	8	16.00%

Question 10. In your opinion, would an assistive technology Lending Program - that allows individuals to borrow assistive technology devices for short periods of time - be helpful in Ireland?

Answer	Count	Percentage
Yes (Y)	44	88.00%
No (N)	0	0.00%
No answer	6	12.00%

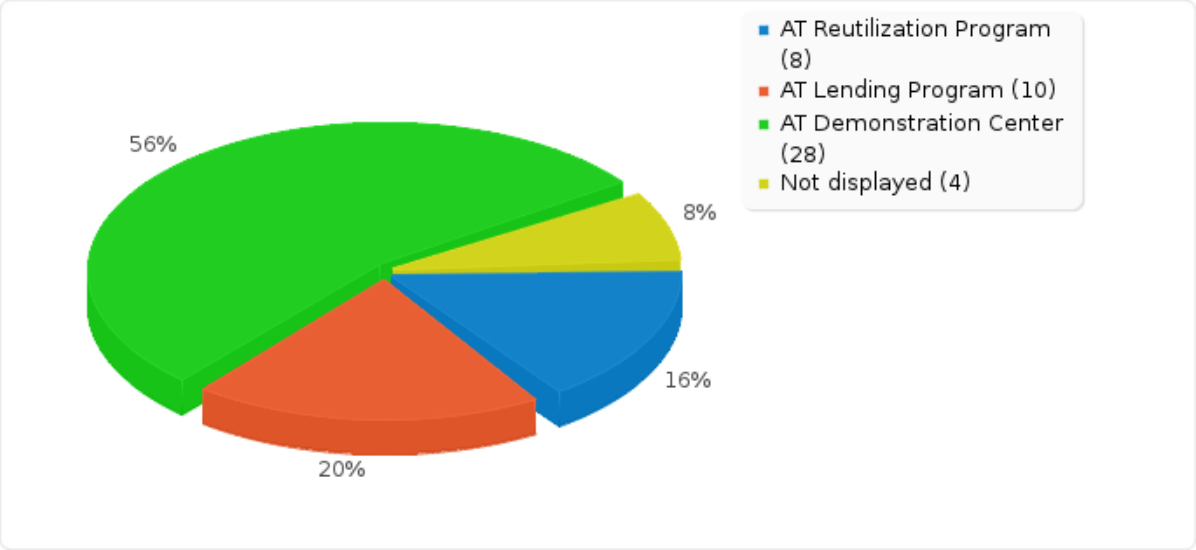
Question 11. In your opinion, would an assistive technology Demonstration Centre - that displays the newest assistive technology devices and allows people with intellectual disability to try them out with aid from technical staff be helpful?

Answer	Count	Percentage
Yes (Y)	40	80.00%
No (N)	2	4.00%
No answer	8	16.00%

Questions 12. Please put the above proposed assistive technology programs in order of importance to you by ranking

When asking to put the above three assistive technology programs in order of importance, 56% participants responded that assistive technology demonstration centre would be most important programs, followed by 20% response assistive technology lending program, 16% response assistive technology reutilization program, 8% choose not to answer the question, see Figure 9.

Figure 9 Ranking of Assistive Technology Programs



4.6 Assistive technology training and education

As regards about assistive technology training and education in Ireland, the participants opinions are listed in Table 5 below. In answering whether or not if there has been enough assistive technology conferences and seminars held in Ireland, 80% response were negative, only 8% response "yes", 6 (12%) participants choose not to answer the question. The next question is further exploring how often participants attended assistive technology conferences and seminars, results were still negative which is in consistence of previous question, 68% participants responded that they attended conferences and seminars once or twice a year, while 24% which counted 12 participants had never attended any form of training, 4 (8%) participants didn't answer the question. 88% participants also responded that they would wish to attend at least once a year if there were more assistive technology conferences and seminars available.

Table 5 Assistive Technology Training and Education

Questions 13. Have there been enough assistive technology conferences and seminars held in Ireland?

Answer	Count	Percentage
Yes (Y)	4	8.00%
No (N)	40	80.00%
No answer	6	12.00%

Questions 14. How frequently have you attended?

Answer	Count	Percentage
Never (1)	12	24.00%
Once a year (2)	32	64.00%
Twice a year (3)	2	4.00%
Three or more times a year (4)	0	0.00%
No answer	4	8.00%

Questions 15. How often would you attend if there were more assistive technology conferences and seminars?

Answer	Count	Percentage
Never (1)	0	0.00%
Once a year (2)	18	36.00%

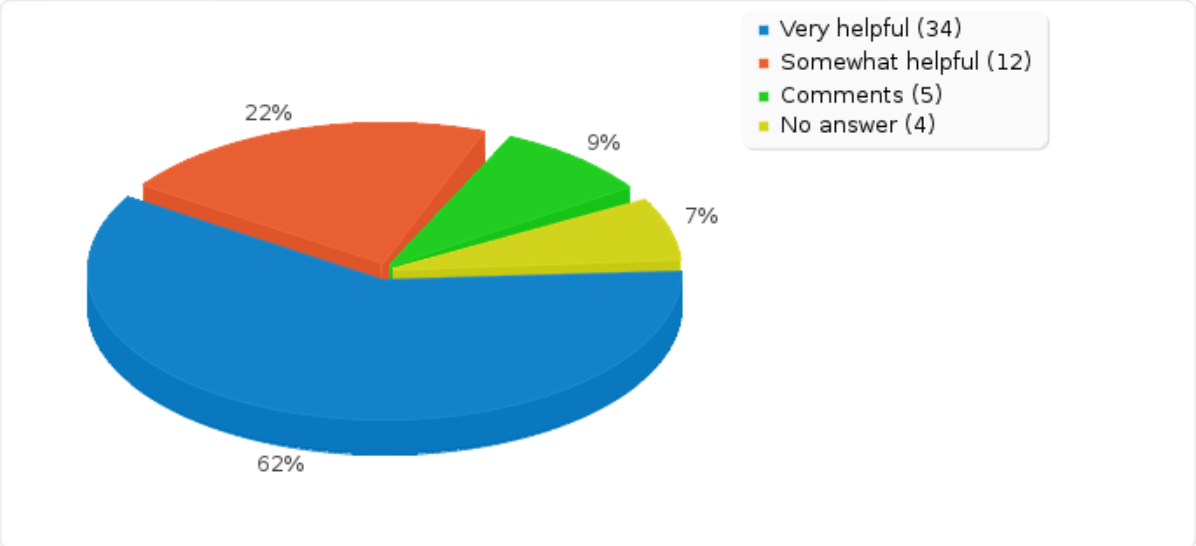
Twice a year (3)	16	32.00%
Three or more times a year (4)	10	20.00%
No answer	6	12.00%

4.7 Assistive technology online newsletter and information website

The next two questions investigate participants' attitudes and opinions about the usefulness of internet, in particular online newsletter and information website as the means to promote the assistive technology information sharing. The response is overwhelming positive from both questions, majority of the participants recognized that online newsletter and information website are "somewhat helpful" or "very helpful" in regards to providing up-to-date assistive technology information, see Figure 10 and Figure 11 below.

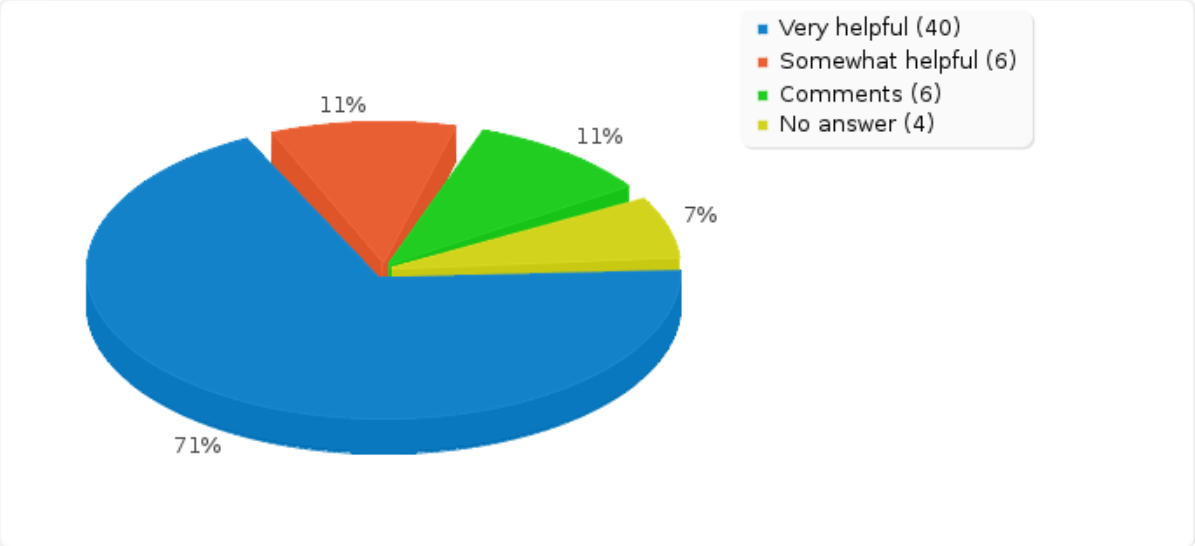
Questions 16. In your opinion, how helpful would an online newsletter - which would periodically update you on assistive technology news and information through email - be?

Figure 10 Assistive Technology Online Newsletter



Questions 17. In your opinion, how helpful would an assistive technology information website - provide practical and up to date information of assistive technology device/solution - be?

Figure 11 Assistive Technology information website



4.8 Open ended question

Question 18. Are there any other recommendations or comments you would like to make about how can we better meet the assistive technology needs of people with intellectual disability in Ireland?

Total 25 participants wrote comments to this survey, themes emerged from those comments are:

1) Participant positively agree that appropriate use of assistive technology can promote people with intellectual disability to living independently, however, a maximum user and stakeholders involvement is needed in order to make this goal achievable.

P: …to allow people to live more independent lives and develop more person centered activities assisted technology will be a part of future developments

P: … liaising with a cohort of individuals who has intellectual disability to explore their opinions might prove beneficial.

P: … this should be a two way process where users and their advocates can be involved in the delivery and the design of AT…

2) People with intellectual disability can have very specific requirements to the assistive technology due to their cognitive impairments and other factors. They may need to learn some pre-requisite skills in order to fully utilize the assistive technology; also, as-

sistive technology may need to be highly customized in order to meet individual's needs.

P: Many people with ID, and their families, are impressed by AT, and don't realise the pre-requisite skills needed to enjoy some ATs. e.g. many parents of children with autism are excited by the iPad and Grace for communication, yet frown upon PECS, without realising that PECS training is essential for Grace. I think there needs to be an understanding that AT is not a panacea, and better information about pre-requisite skills and training.

P: we need to get better at empowering indiv's with id to take the risks and dare to dream of what is possible for them. We need to interface with AT providers to design devices specific to the unique needs of some of our most challenging service users.

P: … For information and products to be relevant to users with an intellectual disability they must be designed to meet their skills and needs…

P: … Only one problem I haven't sorted so far and I am still working on it. I rely heavily on CRC for answers but they don't specialise in ID so that often presents new problems…

3) The assistive technology information shortage which has already been identified from literature and through previous survey questions is re-emphasized by participants' comments.

P: The more information, the more real world practical examples of successful implementations, the more likely people will use it.

P: I am involved in the area of AT and would really appreciate any information in any format on AT specifically for people with an Intellectual Disability.

P: (The information needs to be) specifically relevant to people with an Intellectual Disability.

P: Assistive Technology is a broad term, there is a vast choice of products/devices on the market and these choices are constantly evolving…

4) Financial constraints which relevant to the cost of the assistive technology and limited funding resources are the main concerns of some of the service providers.

P: …Costing of devices is a factor which prevents some people from using assistive technology…

P: Funding is a major issue. There are supports around lending of devices for example through the Central Remedial Clinic or technology companies. However, information on the various groups/departments, if any, that funding can be applied for would be helpful or a forum on how others have secured funding.

5) Results from previous survey question (Question 11) shows that 80% of participants agree that AT demonstration centre can be very helpful to promote assistive technology usage; some of them further explain the reasons here.

P: The sector is growing very fast and the amount of technological support is vast. Without a system of access and demonstration it is impossible to find the time to search for and keep up to date on developments. It would be wonderful to have access to a national centre which could make information easily and readily available by drawing together the latest developments and solutions. At the moment we are very dependent on information that comes from the assistive technology companies themselves in their advertising literature which of course is not objective!

P: If it also provided demonstrations of the technology and suggestions about the suitability for different categories of people and situations

P: A knowledge base that shows how AT is being used other than how it was attended to be used e.g. PIRs being used for wanted movement other than unwanted movement - there will always be people using technology to do things other than what it was meant for.

6) Lack of training was identified by 36% participants as the main barrier in the previous survey question (Question 8). Some of the participants explained their reasons as below.

P: Training is my main concern… the questions how frequently you have attended an assistive technology conference - I answered once a year but that is not correct - I have attended conferences but not as often as once a year.

P: I think there should be more seminars/workshops on assistive technology - particularly around how it would support independence and a better quality of life for people with intellectual disability.

7) Majority of the participant whom left comments are overwhelming positive about the use of online information sharing in the form of online newsletter and information website to promote the usage of assistive technology by people with intellectual disability.

P: New information would be great to receive on line as with present restrictions in the health service it can be difficult to attend seminars

P: A newsletter that discusses what people found useful, not something that suppliers tell of new devices, as this is already available. We have an AT intranet website, giving information

and links, but it is very difficult to get staff members to contribute on what did or did not work for them

P: (Information website) this would be more relevant than a newsletter as I would log on when I need it.

P: (Online newsletter) … very useful to keep updated

P: Assist Ireland provides a useful website and we have one internally. It all helps to spread information.

P: Some more information important but also important to have links with other websites.

P: (Information website) … sharing Best Practice, communicating successes and disasters with the various solutions and scenarios, will help people to make informed decisions.

5 Discussion

5.1 Introduction

This chapter discusses the findings from this research and relating it to the other academic studies. In general, the results of this study shows that the majority of the service providers believed in using of assistive technology can promote the independence of people with intellectual disability from six functional domains: living, working, community integration, education, communication and socialising. However the lack of information of needed assistive technology for people with intellectual disability which has already been identified through various previous studies (Wehmeyer 1998; Carlson and Ehrlich 2005; Mirza and Hammel 2009) is proof to be still one of the major obstacles stopping people with intellectual disability from benefiting from the use of assistive technology through this research. High cost, Lack of skilled professionals to make good recommendations, Lack of funding are the top three barriers and there is no simple solutions to overcome those barriers. Majority of the participants agreed that AT reutilization program, AT lending program and AT demonstration centre can promote the usage of assistive technology by people with intellectual disability, among those three programmes; AT demonstration centre is the most important. Through this study, it is also indicates that it is still a major challenge for service providers to receive adequate and necessary training and education in order to support people with intellectual disability to use assistive technology in the context of person centred service. The use of online newsletter and information website can help to promote assistive technology information sharing thus to increase the usage of assistive technology by people with intellectual disability.

5.2 Use assistive technology to promote person centred service

Living independently does not necessarily mean living or doing everything on your own. It means individuals has the control of his/her own life, be able to make choices about everyday life, having equal responsibilities and rights as any other citizens in the areas such as education, employment, socialising and polling. People with intellectual disability need support to be able to live independently; every person with intellectual disability has different cognitive, sensory, physical and other needs to be accommodated in order to be able to live independently. Person centred services is the promising means to support people with intellectual disability to be able to live a meaningful life. It requires the collaboration between both service provider and

service user. In order to achieve this goal, both service providers and service users have to involve and actively participate in the provision of person centred service through service planning, budgeting, evaluating and continuous reassessment. Implementation of person centred service is much depends on the availability of resources to create a systematic structure in which people with intellectual disability can be able to make their own choices regarding everyday living and easy access to communities (Rooney, Koornneef et al. 2010). The provision of using assistive technology to promote independent living is an essential element of developing quality person centred service to the service users. From the service users' perspective, appropriate use of assistive technology can promote their dignity, respect, enable them to make their own choices and be able to control their own life. For example, a talking mat can help a user with communication and memory deficit to express his/her opinions freely. From the service providers' perspective, appropriate use of assistive technology can help allocate the staffing resources more efficiently to the most needy service users and make direct savings to the health care cost by move people with intellectual disability out of expensive residential care to the community and home environment. For example, the service user with epilepsy can be left without disturbance and have a good night sleep by using epilepsy sensor in the night to detect seizure activities instead being monitored by care staff physically entering into their room hourly, care staff only need to attend to the user when the sensor is alerted.

5.3 Gaining knowledge based information about assistive technology

5.3.1 Information about assistive technology in general

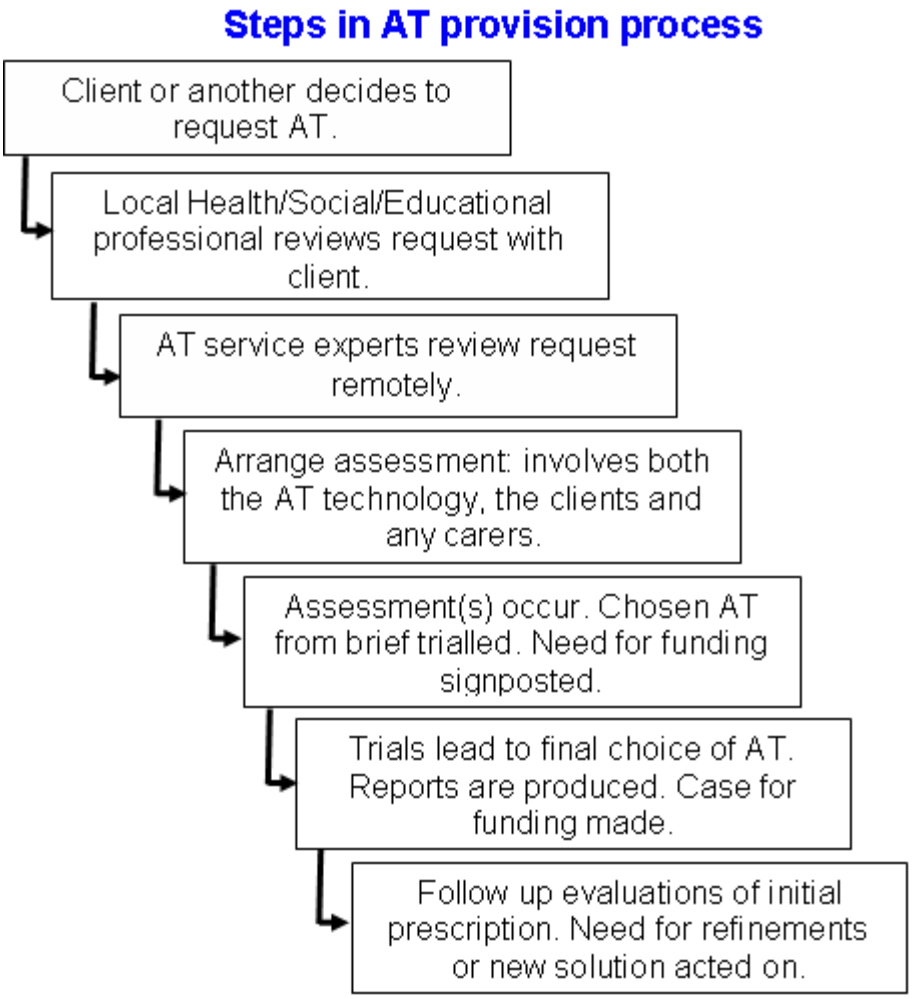
As results from this research and other research (Wehmeyer 1998; Carlson and Ehrlich 2005), there is strong evidence of information deficiency about assistive technology usage in the intellectual disability sector. Service providers as well as people with intellectual disability and their families are all facing the same difficulties - where and how to find most useful assistive technology to enable individuals with intellectual disability to live in an independent and socially inclusive lifestyle. Assistive technology related information is much needed by service providers in the provision of planning person centred service for people with intellectual disability. Some of the recent policies and guidelines from the Government of Ireland have already included assistive technology as initiatives to promote the support services to people with disabilities including people with intellectual disability. The Health Information and Quality Authority (HIQA) HTA guideline which was published on November 2010 provides an overview of the principles and methods used in assessing health technologies including assistive technolo-

gy. As a national health guideline, it gives the guidance to how to timely, consistent provide reliable and appropriate assistive technology services and support to people with disabilities (HIQA 2010). National Strategy for Higher Education to 2030 also highlights the use of assistive technology as national initiatives to support people with disabilities including intellectual disabilities in further and higher education (Hunt 2011).

5.3.2 Information about obtaining and continuous usage of assistive technology

There is less information about how to obtain assistive technology than information about assistive technology in general. It is important to select the right assistive technology for the right persons during the initial assessment and it is also important to receive adequate and necessary information of assistive technology through its usage life cycle. In order to achieve this, service providers need to be equipped with the knowledge of the factors which can affect the successfully continuous usage of assistive technology such as product adaptability, security, cost, reliability, repair and maintenance. Figure 12 below shows a typical assistive technology requisition process.

Figure 12 Assistive Technology Requisition Process



Source taken from (Dewsbury 2005) Telecare and assistive technology to support Independence for people with learning difficulties

In further details, the process for obtaining assistive technology can involve some or all of the following steps:

1. Establish a vision: this is the picture of ultimately future the service user can achieve by using assistive technology effectively.
2. Establish service user and service provider's goals: What are service users' expectations? What are service providers' expectations? How to achieve those goals?
3. Seek information on assistive technology: what are the available assistive technology choices? Is there training provided? How well this particular assistive device can perform?
4. Establish device criteria: Are there any limitations of this technology? What are the risks? Is there any alternatives?

5. Assistive technology trial: Request a trial period whenever possible or join an AT lending program. So the assistive technology can be tested before actually purchasing it. This issue will be discussed in further details in following paragraphs.
6. Discuss compromises and trade-offs: Ask for a discount whenever possible.
7. Consider legal issues: What legal responsibilities do service providers have by providing assistive technology to their service users? What legal rights the service users entitled to?
8. Seeking funding: Funding can be very complex and time consuming, and there are no simple solutions to this. This issue will be discussed in further detail in following paragraphs.
9. Identifying the best option: what is the best option available on the market? What is the cost performance? How are the users' experiences on this particular technology?
10. Define user's specific preferences and requirements: These include information about user's age, background experiences, preferences, abilities, and health conditions.
11. Purchase the assistive technology.

Information can be useful for continuous usage of assistive technology is including:

1. Adaptability: Is this particular assistive technology possible to Integrate with other assistive technologies? Can it be upgrade or compatible with latest technologies?
2. Security: Is it reliable? Where can the technology been used, indoor or outdoor? Does it need to be insured?
3. Training issues: what skills the user need to learn in order to manipulate the device? Where to get training? Is there training provided by the manufacturer?
4. Maintenance and repair: Is there a warranty and what does the warranty cover? Is it easily repaired? Is there an on-going service or update packages available?
5. Evaluate effectiveness: what is the average use? How long the battery can last?
6. Review on-going effectiveness: Is the particular assistive technology easily customized or modified to suit the individual user's change of needs?

(Scherer 2004)

5.3.3 Quality of information

The quality of information is as equal important as the amount of the information received. As we are living in an information bombing society, the amount of the information has already available and been created every day is huge. For instance, just do a simple online search,

Google “assistive technology” returns 8,940,000 results in 0.15 seconds; Google “assistive technology intellectual disabilities” returns 146,000 results in 0.19 seconds. New technologies are invented every day. It is impossible to master all the information available about assistive technology. The majority of people with intellectual disability and their families are making enquiries from their service providers as the first stop to gain information about assistive technology (Wehmeyer 1998). The quality of information they received from their service providers is varied. Much information especially assistive technology information which is available from health services is derived from assistive technology manufacturers. A lot of assistive technology information which service providers received is directly from manufacturers through promotional mode, newer assistive technologies which are often more expensive are the most promoted and advertised by the manufactures. Often, information is more technically related rather than practically related. The information is often distributed as product brochures and leaflet. Descriptions about those products are hardly in a neutral position. Some of the comments received from survey participants have addressed this issue:

“…we are very dependent on information that comes from the assistive technology companies themselves in their advertising literature which of course is not objective!”

“The more information, the more real world practical examples of successful implementations, the more likely people will use it.”

Due to the lack of assistive technology guidelines at national level, there is no agreement about what assistive technology products information should be provided as a standard set of information. Lack of evidence based information is another issue which refers to lack of evaluation information of different products. As a result, the comparison of different assistive technology products from different providers can be very difficult or impossible task. Other criteria need to take in to consideration in relation to quality of assistive technology information are information needs to be evidence based, updated, independent, comprehensive, ready available and easy accessibly (Alliance 2010).

Though Results from this study shows a considerably high rate of positive agreement in relation to quality of information, 80% of the respondents rated the quality of information about assistive technology they received are at or above average level, it should be noted that the percentage presented here are only related to the assistive technology information that the respondents have already received which identified as only 28% respondents think they received sufficient amount of assistive technology information in general.

5.3.4 Awareness of assistive technology

In past few centuries, people with intellectual disability were generally lived behind the gates of institutions and treated as a special group; the general public had little or no opportunities to come into contact with them. The situation has changed over past 20 years, more and more people with intellectual disability have moved to community environments, their capabilities rather than their disabilities have begun to be recognized and accepted by the general public (McConkey, Abbott et al. 2007). Through the rapid technology advance in past decades, it has been a dramatically progress in assistive technology usage, the range and type of assistive technologies available are much richer compare to 10 years ago. The responses to this survey indicate that, general awareness and recognition about use and need of assistive technology by people with intellectual disability is much improved compare to 10 years ago. More and more people are positive about the benefits of using assistive technology by people with intellectual disability and realize that people with intellectual disability are able to live in the normal communities, receive education, have a job and enjoy socialize alongside their peers without disabilities.

5.4 Overcome barriers

Ideally, people with intellectual disability should have the equal rights as any other citizens, to live a life of their own choices, to be able to achieve active citizenship (Ireland Government 2007). However, in current circumstances there are still a lot of obstacles and gaps that prevent people with intellectual disability to be benefit from assistive technology. The research identified three top barriers from service provider's perspective, those barriers are discussed below.

5.4.1 High costs

It has been revealed from literature that many people including the service provider staff see assistive technology as an expensive option for people with intellectual disability and there is only very limited funding available (Anderson, Larson et al. 2011; Carey et al. 2005; Scherer 2004; Wehmeyer 1998). 60% participants from this research identified high costs as the No. 1 biggest barrier to the use of assistive technology. Whilst a lot of people with intellectual disability come from a low income group, the new and high tech assistive technologies which are the same like any other new technologies can be very costly, often the price is far beyond the majority of people with intellectual disability can afford. On top of that, new assistive technology is seldom covered by funding sources (Disability 2000; Carlson and Ehrlich 2005).

There are contrasting opinions coming from various academic papers showing that appropriate use of assistive technology can be cost saving in the long term (Jones and Doughty, 2011, Mann et al., 1999, Hunt, 2011). For example, an assistive technology project which providing support housing services to 11 service users with intellectual disability in Kent, UK has successfully improved quality of life outcomes for residents while reducing staffing costs (Hunt 2011). Jones and Doughty (2011) described efficiency saving of over £100,000 in the first year of using assistive technology to support six service users with intellectual disability living in community houses.

There are also some alternatives ways to avoid high costs; cost-effectiveness can be achieved through various solutions such as:

- Using main-stream technology with universal design features whenever possible.
- Considering low tech assistive technology solutions before purchasing high tech assistive technology. If low tech assistive technology can do an effective job, use low tech assistive technology solutions which are generally much cheaper.
- Trying out assistive technology first through an AT lending centre or from a manufacturer before purchasing.
- Purchasing second hand assistive technology from AT reutilisation centre.

5.4.2 Lack of skilled professionals to make good recommendations

It is not an easy task to share the knowledge about assistive technology. There is so much assistive technology information available yet it is hard to find quality information which is related to individual's needs. It may not be reasonable to expect all service providers to expertise in all areas about assistive technology. A skilled assistive technology professionals, or so called assistive technology specialist who is able to provide specialized assessment, recommendation, guiding, evaluation, training and coordinating others in the area of assistive technology, is significantly important to advice the service providers in provision of providing effective assistive technology. Within current practice in Ireland, assistive technology specialists' role is often shared by professionals from diverse disciplines such as occupational therapists, physiotherapist and speech and language therapist, their competency and knowledge in assistive technology is varied. Compare to assistive technology specialist has been in practice for many years in United States, service providers in Ireland only have limited awareness of the existence of such a defined position. It is difficult to find experts who understand the full range of assistive tech-

nologies. A competent assistive technology specialist should be able working collaboratively with other professionals, to assess, coordinate, develop, and implement assistive technology solutions (Kintsch and DePaula 2002).

5.4.3 Obtaining funding

Despite the economic downturn, the Irish government is still increasing the funding to the assistive technology services. Under Primary, Community and Continuing Care Sub-Programme and the Multi-Annual Investment Programme 2006-2009 of National Development Plan, a €220 million of funding is available for the people with disabilities including intellectual disability to upgrade their living environment including the use of assistive technologies (NDP 2006). National Health Information Strategy which came with an estimated €475 million initial budget with continuous investments has already made it a priority to develop a national healthcare ICT system (Health and Children 2004). With all the efforts made by the Irish government, funding of assistive technology is still a very complex issue. 52% participants in this research recognized that lack of funding is one of the main barriers. Funding can come from both private and public sources. Currently, Health Services Executive (HSE) is the major funding source of the public funding in Ireland. The majority of funding is provided under the Aids and Appliances scheme; for students with intellectual disability, funding can also be sourced though the Department of Education and Science; for employers who need to purchase assistive technology for an employee with disability, funding is available through workplace equipment and adaptation grant, employment support scheme and employee retention grant scheme; for smart house projects, housing adaptation grant is available through Department of Environment; for people with mobility problems, Motorised Transport Grant can be obtained from the HSE.

Those funding is available to people with intellectual disability as well as people with physical and sensory disabilities, the demand for assistive technology is often exceeds available funding. On top of that, there are no specific guidelines to follow; different regions have different practices as for the funding procedures. Thus to obtain funding to purchase assistive technology is a very complex and time consuming process (Assistireland.ie 2011). Funding is also available through some other limited resources including independently controlled trusts, trade associations, fund-raising charities and consortium of manufactures (Alliance 2010).

5.5 Reutilisation, lending and demonstration of assistive technology

The purpose of those three programmes is to improve access to assistive technology by means of reuse, short-term loan or demonstration. The assistive technology demonstration centre can demonstrate the technologies and make suggestions about the suitability for different categories of people and situations. The assistive technology lending programme enables people to try out the program before considering purchasing. Assistive technology can be loaned through a particular assistive technology company who is selling such products or through assistive technology lending program. Those programmes could benefit both service providers and people with intellectual disability. The service users can play an active role in selecting the assistive technology that best match their needs – leading to more successful device selection, better use of resources, and enhanced independence. The following section will discuss about four major resources of those programs in Ireland - the Central Remedial Clinic, Enable Ireland, the Reuse Technology Centre Ireland and a newer initiative -Try-it.ie. Those assistive technology programs are generally targeted at wider user groups including old aged people and people with disabilities.

5.5.1 Try-it.ie

Commencing on 2008, Try-it.ie is a AT lending program co-ordinated by the National Rehabilitation Hospital, Enable Ireland and the National Council for the Blind of Ireland. It allows service providers and people with disabilities to borrow assistive devices for a trial period before considering to purchase. It gives people access to try the latest assistive technology for a short-term period typically four weeks. The loan period helps service providers and users to make the right decisions to choose most appropriate assistive technology to buy. It's estimated that over €250,000 in savings were made by avoiding inappropriate assistive technology purchases from its first year operation. In 2009, Try-it.ie won the award of ACCESS-IT@home in London. At time of this report, due to unforeseen circumstances, Try-it.ie has stopped service of dispensing loan devices until further notice. (www.try-it.ie)

5.5.2 Central Remedial Clinic

The Central Remedial Clinic (CRC) is a non-residential national centre that provides demonstration and trialling of assistive devices services for the people with physical disabilities. A lot of people with intellectual disability are also having physical disabilities; CRC provides wide range of assistive technology products information, referral can be made for the access to the CRC services for the demonstration and try out of assistive technologies (www.crc.ie).

5.5.3 Enable Ireland

Enable Ireland was originally founded in 1948 as Cerebral Palsy Ireland; it provides free services for people with physical disabilities. As part of their services, assistive technology trialling and demonstrations are provided. Enable Ireland also makes recommendations, gives advice and provides training courses. They also have an information website with online newsletter section that provides useful assistive technology information. (www.enableireland.ie)

5.5.4 Reuse Technology Center

The reutilisation program is a cheap and environmental alternative to buying a costly new assistive technology. The Reuse Technology Center Ireland is a non-profit program that aims to provide computer technology reuse services to people with disabilities and other disadvantaged groups. The technology devices which are no longer useful by individuals and companies are donated to the centre which is then redistributed to people whom cannot afford to buy the new assistive technology but can benefit from it. (www.atireland.ie/rtcenter)

5.6 Training and education

It is identified from the research that assistive technology training is much necessary to enable service providers to provide better assistive technology service. Without human involvement, assistive technology itself is just a piece of device or software. It is no useful if only been kept in storage room or displayed on a shelf because service providers do not know how to use them (Mechling 2007).

Majority of the participants from the research responded that they would attend more assistive technology seminars and conferences if it is available. One of the participant commented *"I think there should be more seminars/workshops on assistive technology - particularly around how it would support independence and a better quality of life for people with intellectual disability. A lot of concentration is put on assistive technology which supports communication but I think it needs to be much wider than - smart technology which supports all aspects of a person's life."*

Currently there are only a few organisations which provide assistive technology training and education to both professionals and service users. Service providers need to know how assistive technology can be beneficial to the service users in the process of planning person centred service, service users need to know how to use assistive technology to maximize their full

potential to living independently. In Ireland, Assistive technology trainings are provided by the CRC (the assistive technology diploma), Enable Ireland (national AT training services), University of Limerick (ATAC project) and also a few other resource centres. There is no national level qualification framework available currently. Some of the trainings are provided by assistive technology manufacturer which mainly information about usage of their own assistive technology products. None of those training programs mentioned above are specialised in the use of assistive technology by people with intellectual disability. The training in assistive technology are often not covered the special needs raised by cognitive impairment. There are only a number of limited the seminars and conferences which provide information about assistive technology to the professionals working with people with intellectual disability. A recent seminar "From the Dinosaur Era to the Digital Age –Using Technology to Support Ordinary Lives" held by FEDVOL received an overwhelming response from the attendants. Majority of the attendants are professionals from the different service provider organisations which provide services to the people with intellectual disability in Ireland. During the seminar, a lot of the attendants expressed feeling that there should be more seminars and conferences like this in Ireland.

5.7 Improve information availability and sharing through internet

Analyses from this research and previous study suggested that limited assistive technology information availability and sharing is still a major obstacle stopping people with intellectual disability from efficient and effective use of assistive technology (Wehmeyer 1998). At least in part, the issues of information deficiency can be solved by providing online based solutions. Information can be access through different formats such as face-to-face, telephone, hard copy, television and online. The rapid development of internet has led the online information becomes unarguably the most accessible information format in our modern society. Countless volume of information is sourced from the internet; a lot of people are in favour of reading news through online news websites, communicating with friends through socialising networks such Facebook and Twitter, writing online blogs instead of diaries, sending emails instead of posting letters. In Ireland, 99% population have internet access coverage, high speed broadband access is available through telephone, TV cable, mobile networks and satellite, and can be accessible through various devices such as PC, laptops, digital interactive TV and mobile devices. Majority of the participants in this research agreed that online newsletters and a website which would provide assistive technology information and also have a section that specifically relevant to people with intellectual disability could be very helpful. There are a lot

advantages to receive and share information online, flexibility, no location or time restrains, up-to-date, interactive, use of multimedia are some of the main merits. The online information can attract significantly more audience than traditional medias, for example, analysed by using Google Analytics, the factsheets which provides information about assistive technology from Disabled Living Foundation(DLF)'s main website has been downloaded more than 20,000 times in 2009; whereas in another website, www.livingmadeeasy.org.uk, which provides useful and practical information about assistive technology received c.410,000 visits and c.1,600,000 page views in 2009-2010 (AT Alliance 2010), the amount of volume and traffic which presented here is hardly feasible to achieve by access through any other medias. As commented by one of the participant:

"New information would be great to receive on line as with present restrictions in the health service it can be difficult to attend seminars".

There are a number of websites that provide useful information about assistive technology. One of the examples is enableireland.ie which has already been mentioned in previous paragraphs. Other websites includes:

A. Ireland information sources

a) Assist Ireland: Launched on 2005, assistireland.ie is a national assistive technology database developed by the Citizens Information Board. It provides information on assistive technology and has directory of assistive technology products currently available in Ireland to old aged people and people with disabilities. User can browse or search a particular device through their assistive technology database, more than 6,000 assistive technology products information are available through their website. The websites also provides information about funding resources, contact information of assistive technology suppliers, examples of various usages of different assistive technologies. A telephone helpline service also provided by assistireland.ie which can be contacted during normal working hours. (www.assistireland.ie)

B. UK information sources

a) The AT Alliance: this website links the four leading national charity organisations, namely, Assist UK (www.assist-uk.org), Disabled Living Foundation (www.dlf.org.uk), the Foundation for Assistive technology (FAST, www.fastuk.org) and Ricability (www.ricability.org.uk) to provide information about assistive technology , it has in-

formation about latest assistive technology research and development in the UK and acted as an assistive technology information hub in UK. (www.at-alliance.org.uk)

b) Telecare LIN: Founded and supported by Department of Health in the UK, this is an online newsletter service about assistive technology; e- newsletters are sent to subscribers on monthly base. (www.telecarelin.org.uk)
c) The Telecare Services Association: This website provides the information from the Telecare industry in the UK. (www.telecare.org.uk)
d) Smartthinking: developed and maintained by Dr Guy Dewsbury, this website provides information about assistive technology research and design; it also has a link to a blog which has more updated information about assistive technology developments. (www.smartthinking.ukideas.com)

C. The United Sates information sources

a) The Arc: the largest national community-based organisation in the United State with more than 140,000 members that providing services to people with intellectual disabilities. Their website provides information on assistive technology in the format of brief fact sheets and looks at the use of assistive technology in everyday life and in the workplace. (www.thearc.org)
b) ATA: The Alliance for Technology Access is a community-based network that provides information and demonstration of assistive technology to people with disabilities. (www.ataccess.org)
c) ATAP: The Association of Assistive Technology Act Programs provides information about assistive technology programs currently in operation in the United States by implementing the Assistive Technology Act. (www.ataporg.org)

Some of the intellectual disability services providers in Ireland are also provide assistive technology information through their websites but often impartial and relatively low profile, some of the information is limited as intranet only which is only accessible within organisation.

5.8 Summary

Assistive technology has transformed the lives of a lot of people, and it has been particularly important for people with intellectual disability because it often represents the best way - or the only way - for people with intellectual disability to perform certain tasks that people without disabilities do in other ways. The service providers play an essential role to enable the ser-

vice users with intellectual disability to utilize assistive technologies to added value to their quality of life. In this chapter the researcher discussed the research findings based on the context of wider research findings. In general, the study reveals that the perceived understanding by service providers with regard to assistive technology is similar to the results of other studies. Service providers are positively recognized the use and need of assistive technology by people with intellectual disability can enhance their functions in ADLs, communicating, learning, working, socialising, improving mobility, vision and hearing, and controlling of the environment. Barriers to prevent people with intellectual disability to fully utilized assistive technology including lack of information, high cost, lack of assistive technology specialist, lack of training are been discussed. The study also highlighted three assistive technology programs that can promote the use of assistive technology. Lastly in this chapter, the importance of using online newsletters and assistive technology information sharing website are discussed.

6 Conclusion and future work

6.1 Introduction

This chapter provides an overview of entire research. It consists of conclusions of the work has been done as part of this research, recommendations were made based on those conclusions, limitations of the research and suggestions for the future developments.

6.2 Conclusion

This research contributes to an improved understanding of the attitudes and opinions from the service providers' perspectives about the use and need of assistive technology by people with intellectual disability. Several implications have emerged from the current research. First, assistive technology will continue to grow in importance as a key element in provision of providing person centred service. Person centred service is a collaborative model between individuals and service providers. Assistive technology has the potential to enable people with intellectual disability to participant in greater activities and live a life style which would otherwise be impossible or difficult to achieve.

Second, the lack of information of needed assistive technology for people with intellectual disability which has already been identified through previous studies has still proved to be one of the major barriers. Assistive Technology encompasses everything from electric powered wheelchair to virtual learning software, communication aids, iPad with pre-installed video-based instructional program and smart home technologies. The amount of available information about assistive technology is huge, yet it is not easy to find relevant information to match an individual's needs. Service providers need to be equipped with or know where to acquire the necessary information about assistive technology and how to implement it in the process of person centred service, to allow people with intellectual disability to live more independent lives and develop more person centered activities.

Third, financial restrains include high costs and lack of funding is also identified barriers to stop people with intellectual disability benefit from assistive technology. Many service providers perceived assistive technology as an expensive choice. Whilst a lot of individuals shared the same opinion, this is not always the case. There are some alternatives ways to avoid high costs,

for example, purchase second hand devices through AT reutilisation centre, compare prices through different manufactures and choose best cost performance product, lending assistive technology device from AT lending centre to try out before making a purchase thus avoiding purchase the wrong device. The Majority of service providers also expressed that funding for assistive technology is not an easy process. The current Irish funding models are fragmental with no fixed steps to follow. Furthermore, due to a lack of specifications about entitlements and allowance for people with intellectual disability in relation to assistive technology provision, it is hard for current structure to allocate funding resources and prioritize funding for this vulnerable group of people.

Fourth, lack of skilled professionals to make recommendations and lack of training are the other two barriers. These two barriers are closely associated with each other. Due to the fact that there is no national level qualification framework for assistive technology training in Ireland at moment, it is very hard to define the role of assistive technology specialist in the current fragmented system. Furthermore, training and education is very essential to keep both service providers and individuals with intellectual disability to be equipped and updated with necessary information about assistive technology.

Fifth, as identified from this research, the current approach we have in place for the assistive technology information sharing is not sufficient enough, the majority of the participants agreed that it is necessary to develop a national level assistive technology information sharing system based on existing structures including an online information hub and demonstration centres with a specific sector dedicated to people with intellectual disability which could make information easily and readily available by drawing together the latest developments and solutions. The demonstration centres could provide comprehensive assistive technology information and products demonstrations so service providers and individuals could receive professional advice and recommendations about the most up-to-date and relevant assistive technology information before making choices. An information hub including online information website with a newsletter feature as an online resource that can provide access to wide range of assistive technology information for anyone interested would be very beneficial.

Finally, it is concluded from the research that although there are still lots of barriers and limitations, people with intellectual disability can benefit from assistive technology and have better quality of life.

6.3 Recommendations

On the basis of the findings from this research, the researcher would like to make the following recommendations for the development of the use of assistive technologies to support people with intellectual disability living independently:

6.3.1 Develop best practice in assistive technology

The Disability Act 2005 provides a statue-based right for people with disabilities to access public services and requires public bodies to provide the accessible services and information to people with disabilities (Disability Act, 2005). Under this legislation, the National Disability Authority developed a code of practise to guide public bodies to provide information provision, schemes, resources and other benefits to people with disabilities. Even with the legislation, unless there is a systematic approach and mechanism in place to provide quality and easy accessible information about assistive technology at national and local level, it is very difficult to deal with the barriers which have already been identified through the research. Hence it is necessary to develop national standards and best practice to address those issues, the researcher suggests the following recommendations to be considered in relation to develop the best practice:

- Set up the assistive technology information standards according to legal requirements so people could use as the criteria to select good quality assistive technology products.
- Set up assistive technology products standards.
- Set up a nationwide communication network including individuals with disabilities and their family, services providers, clinical practitioners, manufacturers, researchers, policy makers and other stakeholders
- Dissemination of best practice to all stakeholders
- Develop a national best practice guidelines on assistive technology which can be translated into service specific policies
- Nationwide strategies to allow multi-agency work to share resources

6.3.2 Develop assistive technology information hub and demonstration centre

The researcher suggests the following elements needs to be included in the assistive technology information hub:

- A periodic online newsletter which allows users to subscribe
- The website should include the forum and user reviews features which would allow the sharing of practical experiences of the use of assistive technology, communicating successes and unsuccessful stories of using various assistive devices. For example, experience about how assistive technology was actually used rather than how it was intended to be used.
- A one-stop assistive technology products online shop so people can easily identify solutions from a broad range of assistive technology
- A online network support group which collaborate within service providers, assistive technology users, manufactures, universities and other stakeholders
- A online section which has specifically useful and practical assistive technology information for people with intellectual disability
- Apply universal design so the information hub can be accessible by different group of people including people with physical, sensory and intellectual disability

6.3.3 Other recommendations

The researcher also suggested some other recommendations which are listed below:

- Develop the government guidance to assist the service providers and individuals in obtaining funding to purchase assistive technology.
- Develop measurement tool to ensure effectiveness of investment in assistive technology
- Develop an national qualification framework for training on assistive technology
- Develop of programmes to support both service providers and individuals in the use of assistive technology that's currently available in the market

6.4 Limitation

The researcher has identified below limitations that should be considered in interpreting findings and considering directions for future research:

1) The respondents were all members of FEDVOL. Although FEDVOL covers 85% of Ireland's direct service provision to people with intellectual disability. This may still limit the results of the findings to be generalizable to the service providers which are not members of FEDVOL.

2) This survey is a general survey, further in depth study which can provide the comparison from the perspectives of both people with intellectual disability and service providers would be very useful for the service providers to plan future priorities. Those issues are beyond the researcher's scope in this research; however, it can be identified as approaches for future research.

6.5 Future work

The research is aimed to utilize its findings as a baseline measure for future comparisons. The research explored the service providers' perceptions about the use and need of assistive technology by people in Ireland with intellectual disability, further research is required to understand people with intellectual disability and their families' perceptions about the use and need of assistive technology in order to make comparison.

Reference List

Abbott, C., D. Brown, et al. (2011). "Learning difference and digital technologies: a literature review of research involving children and young people using assistive technologies 2007-2010."

Ahmed, A. A. (2010). Perceptions of using assistive technology for students with disabilities in the classroom.

Anderson, L., S. A. Larson, et al. (2011). "2010 FINDS National Survey."

Assistireland.ie (2011). "Funding assistive technology." Retrieved 29 August, 2011.

Atstar.org (2007). "Assistive technology categories." Retrieved 01 September, 2011, from http://www.atstar.org/atinfo/atcat.htm.

Australia Government. (2006). The Disability Act.

Bay Advanced Technologies. (2006). "THE BAT K-SONAR." Retrieved 09 September, 2011, from http://www.batforblind.co.nz/.

Buiza, C., J. Soldatos, et al. (2009). "HERMES: Pervasive computing and cognitive training for ageing well." Distributed Computing, Artificial Intelligence, Bioinformatics, Soft Computing, and Ambient Assisted Living: 756-763.

Burgstahler, S. (2006). "Universal design of instruction (UDI): Definition, principles, guidelines, and examples." DO-IT: Disabilities, Opportunities, Internetworking and Technology, University of Washington.

Carey, A. C., M. G. Friedman, et al. (2005). "Use of Electronic Technologies by People With Intellectual Disabilities." Mental Retardation 43(5): 322-333.

Cambridge, P. and S. Carnaby (2005). Person centred planning and care management with people with learning disabilities, Jessica Kingsley Pub.

Carlson, D. and N. Ehrlich (2005). "Assistive technology and information technology use and need by persons with disabilities in the United States, 2001." Director.

Cheng, Y., H. C. Chiang, et al. (2010). "Enhancing empathy instruction using a collaborative virtual learning environment for children with autistic spectrum conditions." Computers & Education 55(4): 1449-1458.

Cook, A. M. & Polgar, J. M. 2008. Cook & Hussey's assistive technologies: principles and practice, Mosby Elsevier St. Louis, MO.

Department of Health and Children. (2004). Health information: a national strategy.

Dewsbury, G. (2005). "Telecare and assistive technology to support independence for people with learning difficulties."

Dewsbury, G., I. Sommerville, et al. (2003). A dependability model for domestic systems, Springer.

HIQA (2010). Guidelines for the economic evaluation of health technologies in Ireland 2010.

Hunt, C. (2011). National strategy for higher education to 2030.

Hunt, L. (2011). "Assistive technology helps people with severe learning difficulties at night." Retrieved 07 September, 2011, from http://www.communitycare.co.uk/Articles/2011/06/24/117072/assistive-technology-helps-people-with-severe-learning-difficulties-at-night.htm.

IDEA (1990). The Individuals with Disabilities Education Act.

Ireland Government. (2007). Report of taskforce on active citizenship.

Ireland Government. (2005). The Disability Act.

ISO (2008). ISO/TC159/WG2 and ISO/TC159/AGAD

Jones, M. & Doughty, K. (2011). Introducing at and Telecare into learning disability support ser-vices in Gwynedd – benefits and challenges.

Kelker, K. A. (1997). "Family Guide to assistive technology." Let's Unite for Kids (PLUK).

Kelly, C., S. Craig, et al. (2010). "Annual report of the National Intellectual Disability Database Committee 2009."

Kintsch, A. and R. DePaula (2002). "A framework for the adoption of assistive technology."

Lecomte, J. and C. Mercier (2008). "The WHO atlas on global resources for persons with intellectual disabilities: a right to health perspective." Salud publica de Mexico 50 Suppl 2: s160-166.

Lewis, R. B. (1998). "Assistive technology and learning disabilities." Journal of Learning Disabilities 31(1): 16.

LoPresti, E. F., A. Mihailidis, et al. (2004). "Assistive technology for cognitive rehabilitation: State of the art." Neuropsychological Rehabilitation, 14 1(2): 5-39.

Mace, R. (1997). The 7 Principles of universal design.

Mansell, J. and J. Beadle Brown (2004). "Person centred planning or person centred action? Policy and practice in intellectual disability services." Journal of Applied Research in Intellectual Disabilities 17(1): 1-9.

Massachusetts Rehabilitation Commission. (2006). Survey of assistive technology users' needs in Massachusetts.

McClean, B. and I. M. Grey (2008). The nature and effectiveness of positive behavioural support.

McConkey, R., S. Abbott, et al. (2007). "Variations in the social inclusion of people with intellectual disabilities in supported living schemes and residential settings." Journal of Intellectual Disability Research 51(3): 207-217.

Mechling, L. C. (2007). "Assistive technology as a self-management tool for prompting students with intellectual disabilities to initiate and complete daily tasks: A literature review." Education and Training in Developmental Disabilities 42(3): 252.

Mendelson, L., T. Heller, et al. (1995). "The transition from nursing homes to community living for people with developmental disabilities: An assessment of the assistive technology needs and usage." Technology and Disability 4: 261-268.

Mirza, M. and J. Hammel (2009). "Consumer directed goal planning in the delivery of assistive technology services for people who are ageing with intellectual disabilities." Journal of Applied Research in Intellectual Disabilities 22(5): 445-457.

Nagarajan, S. S., X. Wang, et al. (1998). "Speech modifications algorithms used for training language learning-impaired children." Rehabilitation Engineering, IEEE Transactions on 6(3): 257-268.

National Council on Disability. (2000). Federal policy barriers to assistive technology.

National Federation of Voluntary Bodies (2011). "About Us." Retrieved 10 MaThe2011, from http://www.fedvol.ie/Introduction/Default.758.html.

NDP (2006). "National Development Plan 2007-2013." update to original plan). Accessed via www. failteireland. ie: 30-11.

O'Brien, A. and R. Mac Ruairi (2009). Survey of assistive technology devices and applications for aging in place. Advances in Human-oriented and Personalized Mechanisms, Technologies, and Services, 2009. CENTRIC '09. Second International Conference on.

O'Donnell, H. (2011). "Assistive technology to support independence."

Papanek, V. (1970). Design for the real world.

President's Committee for People with Intellectual Disabilities. (2004). A charge we have to keep: a road map to personal and economic freedom for people with intellectual disabilities in the 21st century.

Rice, D. (2011). Universal technology for living. From the Dinosaur Era to the Digital Age – Using Technology to Support Ordinary Lives. Tullarmore, Ireland.

Rooney, A.-M., E. Koornneef, et al. (2010). Guidelines on person centred planning in the provision of services for people with disabilities in Ireland.

Schalock, R. L., S. A. Borthwick-Duffy, et al. (2010). "Intellectual disability: Definition, classification, and systems of supports." American Association on Intellectual and Developmental Disabilities: 259.

Scherer, M. J. (2004). "The matching person and technology model."

Sheerin, F. K. and R. McConkey (2008). "Frontline care in Irish intellectual disability services." Journal of Intellectual Disabilities 12(2): 127.

Special Needs Technology Assessment Resource Support Team. (1996). "Meeting the needs of students with emotional/behavioural difficulties."

Strydom, A., R. Romeo, et al. (2010). "Service use and cost of mental disorder in older adults with intellectual disability." The British Journal of Psychiatry 196(2): 133.

Tassé, M. J. (2006). "Functional behavioural assessment in people with intellectual disabilities." Current Opinion in Psychiatry 19(5): 475.

The Arc. (2005). "Technology for people with intellectual disabilities."

The AT Alliance. (2010). The AT information network: Mapping the information environment, the challenges and opportunities.

Wehmeyer, M. L. (1998). "National survey of the use of assistive technology by adults with mental retardation." Mental Retardation 36(1): 44-51.

Wehmeyer, M. L., S. J. Smith, et al. (2004). "Technology use and people with mental retardation." International review of research in mental retardation 29: 291-337.

WHO. (2010). "Definition: intellectual disability." Retrieved 25 May, 2011, from http://www.euro.who.int/en/what-we-do/health-topics/noncommunicable-diseases/mental-

health/news2/news/2010/15/childrens-right-to-family-life/definition-intellectual-disability.

Appendix A – Online consent form

Survey of Assistive Technology for People with Intellectual Disability in Ireland

TRINITY COLLEGE DUBLIN

ONLINE CONSENT FORM

You are invited to participate in a research study on Assistive Technology for People with Intellectual Disability in Ireland. The research is aimed at gaining a better understanding of needs and barriers of the usage of assistive technology by the people with Intellectual Disability. How service providers can utilize assistive technology to provide person centred services to people with intellectual disability.

This study is conducted by Jing Farrelly, a MSc Health Informatics Student from the School of Computer Science and Statistics, Trinity College Dublin.

This study will take approximately 5-8 minutes of your time. You will be asked to complete an online survey to investigate what are service providers' perceptions about the use and need of assistive technology by people in Ireland with intellectual disability in the context of providing a person centered service?

This survey is divided into five sections and each question is optional. Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time and to omit individual responses without penalty. At the end of the questionnaire you have the option of sending me your comment, which I would highly appreciate. Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised. In the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities.

Your participation in this research will be completely confidential and data will be averaged and reported in aggregate. Although your participation in this research may not benefit you personally, it will help to improve the quality of life of people with Intellectual Disability.

If you would like to have more information about my research and the results of this study, please contact Jing Farrelly at: zhangfaj@tcd.ie.

Please print a copy of this consent form for your records, if you so desire.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, this consent form.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.

- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

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I have read and understand the above consent form and, by clicking the **"Next"** button to enter the survey, I indicate my willingness voluntarily take part in the study.

Appendix B – Survey

Survey of Assistive Technology for People with Intellectual Disability in Ireland

Section 1

To what extent do you agree that assistive technology can contributes to the independence of people with intellectual disability?

Please choose the appropriate response for each item:

	N/A	Strongly Agree	Agree	Disagree	Strongly Disagree
Living independently	○	○	○	○	○
Working	○	○	○	○	○
Participating in the community	○	○	○	○	○
Learning (school, general education)	○	○	○	○	○
Communicating	○	○	○	○	○
Socialising	○	○	○	○	○

Overall, how much information and advice have you received about assistive technology?

Please choose **only one** of the following:

- ○ None
- ○ A little
- ○ Some
- ○ A lot

Overall, how much information and advice have you received about how to obtain assistive technology devices and services?

Please choose **only one** of the following:

- ○ None
- ○ A little

- ○ Some
- ○ A lot

How would you rate the quality of the information you received about assistive technology?

Please choose **only one** of the following:

- ○ Outstanding
- ○ Satisfactory
- ○ Just Okay
- ○ Poor
- ○ Very Poor

To what extent do you agree that assistive technology contributes to the independence of the people with Intellectual Disability?

Please choose **only one** of the following:

- ○ N/A
- ○ Strongly Agree
- ○ Agree
- ○ Disagree
- ○ Strongly Disagree

Do you agree with the statement: Compared to 10 years ago, people are more aware of the need for assistive technology devices and services for people with intellectual disability?

Please choose **only one** of the following:

- ○ None
- ○ A little
- ○ Some
- ○ A lot

Was the information you received able to improve the quality of the life of the people you are supporting?

Please choose **only one** of the following:

- ○ Yes
- ○ No

What do you think is the biggest barriers that you faced in getting the right assistive technology for the people you are supporting?

Please choose **all** that apply:

- ☐ Frustration using AT
- ☐ High cost
- ☐ Lack of funding
- ☐ Lack of training
- ☐ Long insurance approval process
- ☐ Purchased wrong AT
- ☐ Lacks access to a local resource centre
- ☐ Lack of AT loaner equipment to try out for short-term
- ☐ Lack of knowledge on what AT devices are available
- ☐ Lack of skilled professionals to make good recommendations
- ☐ No barriers
- ☐ Other: _____

Section 2

In your opinion, would an assistive technology Reutilization Program - that allows one to swap, repair, recycle, or otherwise re-use various second-hand AT devices - be helpful in Ireland?

Please choose **only one** of the following:

- ○ Yes
- ○ No

In your opinion, would an assistive technology Lending Program - that allows individuals to borrow assistive technology devices for short periods of time - be helpful in Ireland?

Please choose **only one** of the following:

- ○ Yes
- ○ No

In your opinion, would an assistive technology Demonstration Centre - that displays the newest assistive technology devices and allows people with intellectual disability to try them out with aid from technical staff be helpful?

Please choose **only one** of the following:

- ○ Yes
- ○ No

Please put the above proposed assistive technology programs in order of importance to you by ranking them from 1 to 3.

Please number each box in order of preference from 1 to 3. (**1** = Most Important **2** = Important **3** = Least Important)

☐ AT Reutilization Program

☐ AT Lending Program

☐ AT Demonstration Centre

Section 3

Have there been enough assistive technology conferences and seminars held in Ireland?

Please choose **only one** of the following:

- ○ Yes
- ○ No

How frequently have you attended?

Please choose **only one** of the following:

- ○ Never
- ○ Once a year
- ○ Twice a year
- ○ Three or more times a year

How often would you attend if there were more assistive technology conferences and seminars?

Please choose **only one** of the following:

- ○ Never
- ○ Once a year
- ○ Twice a year
- ○ Three or more times a year

In your opinion, how helpful would an online newsletter - which would periodically update you on assistive technology news and information through email - be?

Please choose **only one** of the following:

- ○ Very helpful
- ○ Somewhat helpful
- ○ Not at all helpful

Make a comment on your choice here:_____

In your opinion, how helpful would an assistive technology information website - provide practical and up to date information of assistive technology device/solution - be?

Please choose **only one** of the following:

- ○ Very helpful
- ○ Somewhat helpful
- ○ Not at all helpful

Make a comment on your choice here:_____

Section 4

Are there any other recommendations or comments you would like to make about how can we better meet the assistive technology needs of people with intellectual disability in Ireland?

Appendix C – Invitation email template

Invitation to participate in Survey of Assistive Technology for People with Intellectual Disability in Ireland

Dear Management Team of {ORGANISATION}

I am an MSc Health Informatics student in Trinity College. My research is aimed at to determine service providers' opinions regarding the use and need of assistive technology by people with intellectual disability in the context of providing a person centred service.

In Ireland, more than 85% of the population of people with intellectual disability are supported by voluntary organisations. As part of support services, assistive technologies are often being used by service providers to promote and enhance the independence of people with intellectual disability while at same time achieving cost effectiveness. There is a significant connection between what people perceive and what they practice regarding assistive technology. As part of this research I would like to gain a better understanding of what are the barriers service providers are facing and what kind of information is needed in order to utilize assistive technology to improve the quality of life of people with intellectual disability according to their individual needs.

In this connection, I am currently looking for organisations whom are providers of support services to people with intellectual disability to participate in my research, the research method I am using is by means of an online survey, and the participants are anonymous. The survey will only take approximately 5-8 minutes to complete.

Click here to do the survey:
{SURVEYURL}

I would be really appreciate it if your organisation would take part in this survey which is aimed to help plan the future usage and sharing information of assistive technology by people in Ireland with intellectual disability.

Sincerely Yours

Jing Farrelly

MSc Health Informatics Student
School of Computer Science and Statistics
Trinity College Dublin
Mobile: 0872970418
Email: zhangfaj@tcd.ie

If you do not want to participate in this survey and don't want to receive any more invitations please click the following link:
{OPTOUTURL}

Appendix D – Reminder email template

Reminder to participate in Survey of Assistive Technology for People with Intellectual Disability in Ireland

Dear Management Team of {ORGANISATION}

Recently you have been invited to participate in Survey of Assistive Technology for People with Intellectual Disability in Ireland.

It was noted that you have not yet completed the survey. Hence I would wish to remind you that the survey is still available should you wish to take part.

The survey is titled:

"{SURVEYNAME}"

"{SURVEYDESCRIPTION}"

To participate, please click on the link below.

Sincerely Yours

Jing Farrelly

MSc Health Informatics Student
School of Computer Science and Statistics
Trinity College Dublin
Mobile: 0872970418
Email: zhangfaj@tcd.ie

Click here to do the survey:

{SURVEYURL}

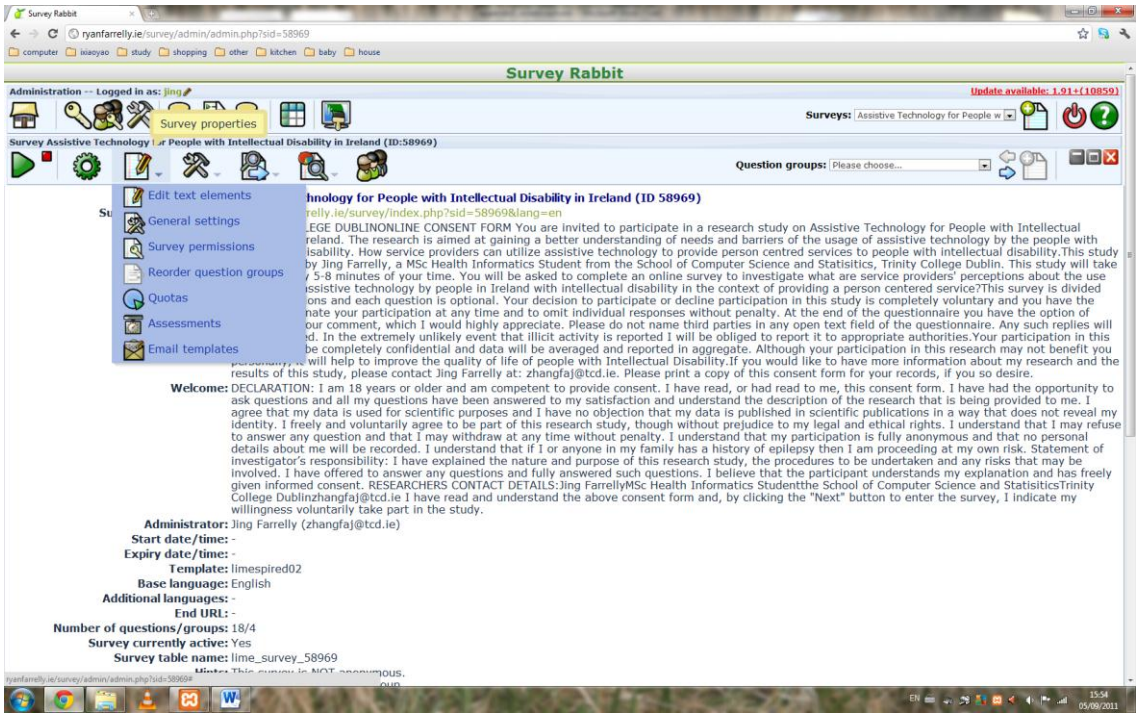
If you do not want to participate in this survey and don't want to receive any more invitations

please click the following link:

{OPTOUTURL}

Appendix E - Survey administration panel

Overview of administration panel



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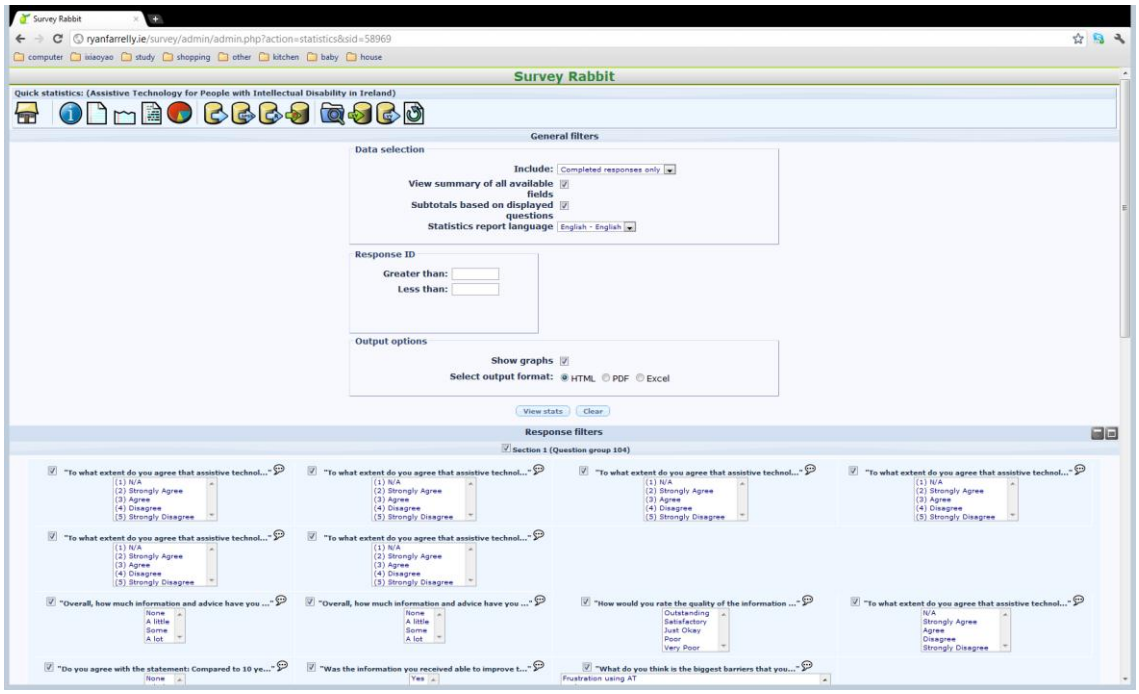

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