



Guide to Independent Living and Assistive Technology for people with disabilities



mada
assistive technology center



www.mada.org.qa

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About Mada

Mada Assistive Technology Centre is a non-profit organization committed to connecting persons with disabilities to the world of Information and Communication Technology.

First opening its doors in 2010, Mada was set up in response to Qatar's commitment to the UN Convention on Rights of People with Disabilities, thereby explicitly recognizing that technology is pervasive across a breadth of private and public sector activities and inherent in the Ministry of Transport and Communications strategy, and works to improve digital inclusion for persons with disabilities in the State of Qatar.

Furthermore, the Qatar National Vision 2030 serves as a clear roadmap to guide economic, human, social and environmental development in the State of Qatar. The growth of our country is dependent on all who live here, and therefore it is our responsibility to cater to all people effectively, support their ability to live independently, and derive equal opportunities when it comes to education, employment and independent living.

We believe that persons with disabilities form an integral part of our society and have tremendous potential to contribute to the growth of the economy. Mada was created to help this community by leveraging on the capabilities of information and communications technology.

The organization strives to do more than just empower an individual; it endeavours to enrich the lives of PWDs to the fullest, by addressing issues in the ecosystem to ensure that they have all the required technology to succeed. To deliver on its ambitions, Mada engages in strategic and operational partnerships with critical players in the PWD ecosystem.

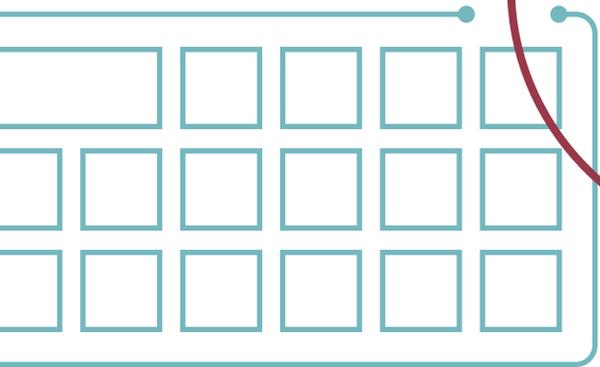
Introducing Independent Living

Independent Living represents a philosophy, or a way of looking at society and disability, with an underlying aspiration to establish equal opportunities, self-determination, and self-respect. More specifically, independent living is a step in the continuum of care.

For many, the biggest barriers to independent living are preconceived notions and a predominantly medical view of disability, contributing to negative attitudes towards people with disabilities. Such attitudes impact people's opportunities for raising families of their own, and getting education and work. These, in turn, result in persons with disabilities making up a large portion of the poor in any country.

The Independent Living philosophy places people with a disability at the heart of the decision-making process, engaging in self-advocacy to design and promote better solutions.





The concept of independent living relates closely to the expectations and aspirations of people with a disability themselves.

At its heart, Independent Living is a social approach to disability where each person with a disability is a citizen, with the rights of all citizens, and with key requirements on the provision of healthcare, rehabilitation or social services. As such they have the same rights for access to the degree of freedom, control and self-determination in everyday life that other citizens take for granted.

There is therefore a strong relationship between the independent living philosophy and universal design. Support services such as assistive technology, income supplements or personal assistants are necessary to achieve equal opportunities. In many western countries, needs assessment and service delivery enable users to control their own services, choosing between competing service providers, enabling them to live with dignity in the community. In such settings, direct payments to disabled people are favoured over services to enhance users' quality of life and cost-efficiency.

The concept of independent living relates closely to the expectations and aspirations of people with a disability themselves, adapting to and enriched by the culture and economic conditions within which people live. The concept has become central to many countries' social policy.

Independent living is not a fixed concept. As it is fundamentally related to choice and the right to make decisions, it varies according to the choices expressed by the individual.



Independent Living in daily life

For many people with a disability, there is a desire to live independently; to achieve the highest level of independence in daily life that is possible. This does not mean that they wish to live alone, but instead seek the support to make their choices achievable. There are many forms of supportive living available to people with a disability across the world. In the Arab world, there is a strong preference for living within the family, whether the disability has been life long, acquired as a child, or as a natural result of aging, trauma or illness later in life.

However, the preference to remain connected to the family does not mean that people with a disability wish to be dependent upon their family. They prefer to be able to perform daily tasks for themselves, have control over their environment, to take care of themselves and connect to the wider community and world. Independence at home has many benefits to people with a disability. They learn to be active, avoiding passivity, to take control and make decisions. Independence helps to boost self-esteem and personal motivation. The provision of tools and solutions within the home can make a significant difference to lives.

But independent daily life cannot be achieved in the home alone. Independence includes mobility and transport, access to other buildings including social spaces and equal access to employment and education. This guide seeks to define how access within the home can be achieved as part of a wider drive to independent life. Successful programs to support independent living operate at three levels:

1. Provision of daily living aids and appliances
2. Provision of home automation and smart home solutions
3. Testing and trialling of innovative solutions and applying research

It is important to understand that these three levels are not exclusive – a long-term strategy to promote independence will take account of all three.

A successful strategy for people with a disability is likely to create an increase in the co-ordinated provision of low tech daily living aids from a range of providers and improvements to the accessibility of the design of user interfaces of currently available smart home solutions.

In developing recommendations to progress provision we suggest the following as key principles to shape a future strategy:

- Independent living is based on the principle of people with a disability having increased control over their own lives.
- Independent living strategies will need to recognise the centrality of the family in the lives of most people.
- The implementation of increased technologies into independent living provision must build upon and integrate with the provision of aids to daily living made available through the State and NGOs.
- Any moves towards the provision of smart homes must ensure that safety, security and privacy are respected.
- Successful smart home initiatives clearly define the roles and responsibilities of partner organisations.
- Partners should include the private sector, where mainstream providers have introduced smart home automation into other markets.
- Successful home automation and smart home initiatives must include maintenance and technical support as part of the package provided to the individual.
- Focus on a relatively small number of projects and products that can be effectively implemented and evaluated over a two/three year period.



Successful programs have also clearly specified the roles taken by stakeholders in implementing accessible solutions:

- **The public sector** should address the issues of regulation and funding. Regulation may be required to ensure the safety and security of those using home automation systems. The sector may also need to consider whether the provision of such systems is an acceptable extension of current initiatives regarding aid and appliances, or will not be publicly funded. If the sector is to take responsibility, funding agencies and budgets should be prepared accordingly.
- **The private sector** is the natural home for the services that install the systems into the homes of disabled people, and maintain them over time. The skills and technical capacity to deliver the services required are likely to be best discovered within the private sector. If the sector is to be involved, it will be important to determine how such services will be procured from within the country.
- **Disabled people's organisations** also play important roles. They can act as a useful link between the customer and the service provider, ensuring that the needs of the person with a disability are understood and supported. This avoids any undue exploitation of vulnerable people by businesses. They also provide an essential role in helping people with a disability to find effective services that can meet their needs, and where the DPO has experience in access and accessibility, can advise and guide the choice of control and interface, although the assessment of control systems in some systems is administered through hospitals.
 - The fast pace of development of home automation and smart homes suggests that **research** has an important role to play in ensuring that solutions are evaluated and that new technologies are integrated into the market in an appropriate manner. In many emerging systems initial testing and evaluation of potential solutions was carried out by a combination of NGOs and higher education bodies.

Policy and Independent Living

The principle of the right to Independent Living is laid down in the UN convention on the rights of persons with a disability. Article 19 (Living independently and being included in the Community) reads: "States Parties to this Convention recognize the equal right of all persons with disabilities to live in the community, with choices equal to others, and shall take effective and appropriate measures to facilitate full enjoyment by persons with disabilities of this right and their full inclusion and participation in the community, including by ensuring that:

- (a) Persons with disabilities have the opportunity to choose their place of residence and where and with whom they live on an equal basis with others and are not obliged to live in a particular living arrangement;
- (b) Persons with disabilities have access to a range of in-home, residential and other community support services, including personal assistance necessary to support living and inclusion in the community, and to prevent isolation or segregation from the community;
- (c) Community services and facilities for the general population are available on an equal basis to persons with disabilities and are responsive to their needs."

The key message of the Convention is that:

- Disabled people have the same rights as everyone else.
- Government and public organizations must work together to make sure disabled people get the rights listed in the Convention.
- Disabled people and their organizations can use the Convention to help make changes and ensure that disabled people get their rights.

Such principles have been expanded into the concept of “Pillars of Independent Living”, or the “12 basic rights of disabled people.” These are:

1. Appropriate and Accessible Information
2. An adequate income
3. Appropriate and accessible health and social care provisions
4. A fully-accessible transport system
5. Full access to the environment
6. Adequate provision of technical aids and equipment
7. Availability of accessible and adapted housing
8. Adequate provision of personal assistance
9. Availability of inclusive education and training
10. Equal opportunities for employment
11. Availability of independent advocacy and self-advocacy
12. Availability of peer counselling

It is important to understand that the convention lays down a framework of rights. It does not dictate how an individual State should deliver those rights. National policy and strategy are shaped and evolve in relation to the cultural and economic conditions of the State. However, in most implementation plans for independent living we see some common features.

Main elements of policy initiatives for Independent Living

In seeking to deliver a policy to ensure that people with a disability have the greatest control over their own lives the following elements should be carefully considered:

- How will appropriate housing or accommodation be made available?
- How will accommodations to the built environment be completed and funded?
- How will the availability of suitable personal assistance and assistants be ensured?
- How will the supply of aids and appliances be ensured?
- How will access to information and communication be ensured?
- How will access to personal mobility be made available and ensured?

Answers to these questions will be determined by the models of independent living and associated funding that are made available. Policy will need to address the balance between community services from the public sector as opposed to direct payments to people with a disability.

Funding models for Independent Living

Fundamentally, there are two models of funding the provision of products and services to support independent living. The traditional model of service delivery could be defined as being controlled by the planning agency. Within this model, the needs of a community of disabled people is evaluated, service requirements are identified and people with a disability are then “allocated” services according to perceptions of their need. Within this model, the professionals will consult with the disabled person but retain responsibility for allocation. This might mean that it is the professional who determines who provides the care, where the care is provided and when it is provided. In many such cases the planning body is also the provider of the services, and those providing such services are direct employees of the agency or public body.

Alternatively, and increasingly seen as being at the heart of decision making and control leading to independent living, is a model referred to as the provision of “direct payments” to people with a disability, with which they can purchase the products and services they require. Such a model of direct payments seeks to stimulate a range of providers of services by creating a market where people with a disability can select the provider who best matches their needs.

Independent Living Policy – foundational feature of accommodation

Policy initiatives for people with a disability draw upon a range of ways in which freedom of choice and decision making over daily life are delivered. No system is delivered through one model of living alone.

At the heart of a policy framework for independent living is the opportunity for the person with a disability to be central to identifying the best form of support for their needs, whilst recognising that needs may change over time as a result of personal or family circumstances, and hence transition to another form of independent living may be required.

The forms of service seek to deliver to clients with different needs. In practice, they provide a continuum of care. Some examples of such care would include:

Home Care:

Used by those who require support for daily living that is beyond the capacity of family and friends without intervention.

Services such as nursing, therapy or personal care are provided to an individual within their own home. This is sometimes divided into:

- Informal care where long-term services are carried out by families and unpaid caregivers;
- Formal home care service involving the aid of paid care workers. In some cases, family are incentivized to provide care, and funding for paid workers is available in different ways. Such provision of support to home care will require accommodations to be made to the home to meet the needs of the person with a disability.

Care within one's family may be supported through the provision of respite services. Such services provide short-term or temporary care of a few hours, days or weeks for the disabled person and their regular caregiver to have a break.

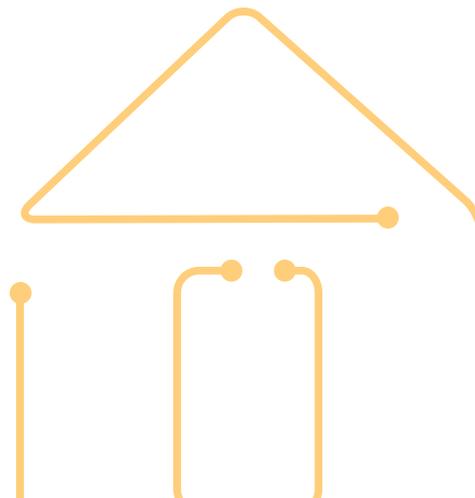
Supportive Housing:

Supported living or housing seeks to combine affordable accommodation with individualized health and social care services for persons with a range of needs. In some cases, it is provided as part of a transition process, but it can be permanent housing in cases such as a group homes for persons with mental illness or learning disabilities. Supportive housing can be used to provide family accommodation where a member of the family becomes disabled as it provides a proven, effective means of re-integrating families and individuals into the community by addressing their basic needs for housing and on-going support.

Independent Living Accommodation:

Those in Independent Living Accommodation are fully independent. Within such residences, meals and services may be offered on demand, and the person with a disability may receive the funding to purchase services and products directly from a provider. This level of control is distinct from Assisted Living where the residence takes responsibility for the provision of personal care, including meals according to a care plan agreed with the person with a disability or family.

An independent living community is typically a housing development that provides full apartment style living. Independent living communities may also offer supportive services such as meals, housekeeping, social activities, and transportation.



Assisted Living:

Used by individuals with the capacity to live independently, but who require a more accommodating environment than the family home can provide but who do not require high levels of daily medical care. Assisted Living is a form of residential care that includes housing together with a degree of shared care. It is intended for those that need additional support and assistance with daily activities but do not require the level of care found in a nursing home.

Assisted living facilities are for people needing assistance with Activities of Daily Living (ADLs) but wishing to live as independently as possible for as long as possible. Assisted living exists to bridge the gap between independent living and nursing homes. Residents in assisted living centers are not able to live by themselves but do not require constant care either. Assisted living facilities offer help with activities such as eating, bathing, dressing, laundry, housekeeping, and assistance with medications. Many facilities also have centers for medical care; however, the care offered may not be as intensive as the care offered at a nursing home.

Additionally, people with severe disabilities must be able to make use of more substantial independent living services such as Nursing Homes, Chronic Care Facilities, Temporary Acute Care Programs and Hospice Care.



Independent Living Policy – links with education and employment

Whilst it is not within the scope of this report to analyse access to education and employment in depth, it is relevant to consider the importance of such access in establishing a continuum of independent living provision.

Access to education provides the person with a disability with the skills and knowledge by which they can consider their needs, understand their options and make informed decisions that impact upon their own lives. Without education, people with a disability are vulnerable to exploitation and may not have the tools by which to challenge poor service or to make decisions effectively. In many parts of the world where models of independent living have been introduced, focussed education opportunities and training in the skills of independent living have also been introduced. Independent living skills programmes are designed to provide meaningful learning opportunities and encourage self-confidence and personal growth whilst promoting independence and social skills.

They will usually include such areas as:

- Personal care
- Developing relationships with others
- Numeracy and literacy
- IT skills
- Accessing local community facilities
- Citizenship and advocacy
- Maintaining a healthy lifestyle
- Emotional and physical health and well being
- Home management skills
- Budgeting
- Cooking and domestic tasks

Courses such as these benefit those who wish to live independently, or who wish to be more independent. They may be part of the transition process from childhood to adult status with a corresponding transition in service providers. Learning these skills can instil confidence in a person and help with their inclusion in their local communities.

In different countries, similar courses are offered in a variety of ways, such as within specialised live-in accommodation or on a university/college campus. Some operate within schools or in a manner similar to schools, where the learner lives at home but attends class every day. The courses aim to support young people to reach their full potential, gaining in confidence and self-esteem while learning practical skills and knowledge.

Access to education also equips people with a disability with the skills and knowledge they require to enter employment on an equal basis to the wider community. Employment offers people with a disability financial independence, reducing their need for direct payments, grants and public social services and providing them with an income that ensures greater levels of personal independence.

Whilst direct payments may be means tested, even where employment generates an income it is still likely that the person with a disability will require some forms of additional support as the costs of mobility, accommodation, technology and personal care are likely to be far greater for a person with a disability than for the wider population. Such payments and services can then help ensure that the person with a disability has the same opportunity for quality of life as anyone else.

2.6 Summary

The development of a wide policy to support independent living for people with a disability is important to achieving the aims and aspirations of any country's citizens with a disability. Such a policy should be established following consultation on the need for the options for forms of independent living within the culture and traditions of that country. It should also consider the manner of funding and the breadth of service and products that are required to ensure that independent living is effective.

However, across all models of delivery, there is need to ensure that assistive aids and appliances, including assistive and accessible technologies are made available. The integration of technologies, aids, appliances and devices can both enhance the quality of provision, reduce cost and maximise personal independence for people with a disability.





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Foundations of Independent Living – Low-tech Aids

In establishing a policy and strategy for independent living it is essential that a firm foundation is built. As a first step ensuring that the form of accommodation chosen by the person is accessible and safe is a priority. Whichever of the forms of housing that is suitable can then be further enhanced by specific aids and appliances to maximise independence. In this section, we will address those low-tech solutions that when combined with an accessible building support independent living. Whilst such an environment can be further improved by the addition and integration of further technologies, unless these priority products are available the impact of new technology will be limited.

WHO Priority Assistive Product List (APL)

To define the foundation or priority technologies for independent living it is useful to consider the WHO Priority Assistive Product List or (APL) as a reference point. The WHO Priority Assistive Products List was the first step of WHO's GATE initiative towards improving global access to assistive products for everyone, everywhere.

The Priority Assistive Products List includes hearing aids, wheelchairs, communication aids, spectacles, artificial limbs, pill organizers, memory aids and other essential items for many older people and people with disabilities to be able to live a healthy, productive and dignified life.

The Priority Assistive Products List is the first of four tools to be developed by the GATE initiative, towards increasing access to high-quality affordable assistive products as an integral component of universal health coverage.

3.2 Aids and appliances

Within the APL there are a series of basic aids and appliances listed that are essential to the principle of independent living. These include:

1. Alarm signallers with light/sound/vibration
2. Canes/sticks
3. Chairs for shower/bath/toilet
4. Communication boards/books/cards
5. Crutches: axillary/elbow
6. Hand rails/grab bars
7. Hearing aids (digital) and batteries
8. Incontinence products, absorbent
9. Magnifiers, optical
10. Orthoses: lower limb
11. Orthoses: spinal
12. Orthoses: upper limb
13. Personal emergency alarm systems
14. Pill organizers
15. Pressure relief cushions
16. Pressure relief mattresses
17. Prostheses: lower limb
18. Ramps: portable
19. Rollators
20. Spectacles: low vision, short distance, long distance, filters and protection
21. Standing frames: adjustable
22. Tricycles
23. Walking frames/walkers
24. Watches: talking/touching
25. Wheelchairs: manual for active use
26. Wheelchairs: manual assistant-controlled
27. Wheelchairs: manual with postural support
28. Wheelchairs: electrically powered
29. White canes

These 29 items represent the minimum standard of provision required to facilitate independent living for people with a range of needs. They can loosely be categorised as relating to mobility, personal care and communication. They are predominantly low-tech solutions that provide the basis of an independent life.

Environmental control in the home

In addition to the products identified through the APL, control over the physical environment requires a second set of products to encourage independent living.

These include aids and devices for use within the home such as: bathing aids, toilet aids, bedroom, stairs, chairs and kitchen aids, and aids for eating and drinking. They also include simple environmental control devices such as: auto-dialler alarms, remote control lighting and smaller items such as key safes, voice recording reminders, medication dispensers and intercoms.

The use of some, or all these devices will increase the confidence of the person with a disability to live independently by enhancing a sense of safety and security. Because many of these are simple accommodations they are highly reliable.

Walking alarms:

These alarms are used to alert a carer or relative if a person moves beyond a designated area.

Medication Management:

These assist people in remembering to take medication. There are a range of products for this.

Prompts and reminders:

More general prompting devices come in a variety of forms. They include small discreet reminder devices that can vibrate at certain times, reminders that play a short, pre-recorded message when they sense movement and reminders that automatically play messages at pre-set times.

Item locators:

Item locators work by adding a small tag to an item and then using a handheld device to find the item when it is not easy to locate.

Alarms and shut off systems:

These alarms are activated by sensors that may detect, gas, smoke, water, sound, movement or breathing. They sound a local alarm and cannot connect to a call centre.

Automatic lighting (internal):

This equipment ranges from small simple units that plug into an electric socket and light a small bulb when movement is detected to units that can switch on overhead lighting and light a whole room.

Remote control sockets:

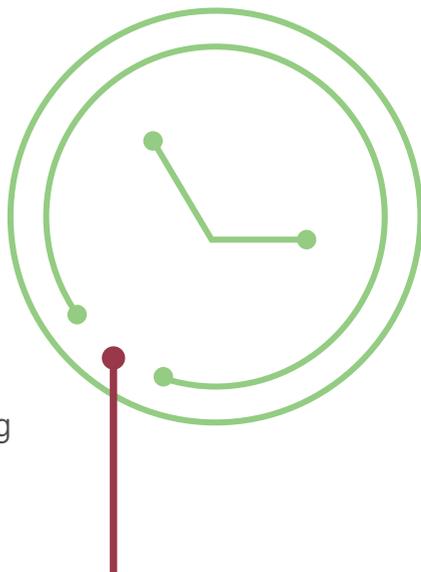
These sockets allow you to plug mains powered devices into a socket and then to control the device (on/off) with a remote control.

Enhanced personal mobility outside the home:

Increased levels of personal mobility can be supported by the provision of more advanced mobility aids. A good example of this is the use of mobility scooters and buggies which may provide a good means to enable independence, giving the user the ability to visit shops, family and friends whenever wished. Such aids need to be selected with care with due consideration of which model of scooter best suits the user's requirements and where it should be purchased from.

3.5 Summary

The use of these priority and fundamental aids, appliances and technologies can help support people with a very wide variety of needs. They represent solutions that have been on the market for many years and offer a very high level of reliability. Use of such solutions will decrease the demands upon family and carers, but will not replace that provision. They will however help ensure that the person with a disability feels increasingly in control of their own living arrangements.



The Role of Technology in Independent Living

Assisted living technologies (ALT) are used as part of a range of services that help people maintain independence. The increase in people using ALT means that service providers need to be more aware of what types of ALT are available and used. Just as technology has become part of everyday life, the use of ALT has also become more established.

There is a wide definition of assisted living technologies, including:

- **Telecare** – Technologies including monitors, controls and sensors, which provide support for people in need of care to live longer at home, in homely environments and in their communities. This may include returning home after a period of illness. It can include both simple and more complex systems and equipment.
- **Digital participation services** – Technologies used to educate, entertain and stimulate social interaction, to enrich the lives of people in need of social support.
- **Wellness Services** – Technologies to encourage people to adopt and maintain a healthy lifestyle, to prevent or delay the need for support.

Such technologies seek to address factors within the environment that prevent a person with a disability acting independently. These can broadly be divided into three categories: Communication, Care and Control.

Communication and information

To live independently there is a need to facilitate communication and access to information for the disabled person. Access to information is extremely important, and it will need to be made available in a range of formats that meet the individual's needs. Information is made available through online services, which are valuable in helping people with a disability to maintain levels of independence.

Further use of apps and online services – which have been designed to be accessible for people with disabilities – would be useful in seeking to promote independence. Examples of services where online information and interaction would benefit people with a disability could include: delivery services, shopping services including home delivery, public transport services and health services.

In addition to access to information, independent living benefits from technology that allows the person with a disability to communicate with a variety of audiences:

- Within the same room; including the provision of communication aids, amplification and assisted listening devices.
- Within the same building; including alerting systems to call attention when help is needed, intercoms, and emergency alarms.
- Within the same town or area; including accessible telephony, text phones and messaging systems.
- Long distance; including access to email, messaging and voice and video communications.
- The combination of access to information and communication provides a foundation to increasing levels of independence for people with a disability.

Care

Technology also has an important role to play in increasing independence for an individual's care needs. At a fundamental level, aids and appliances, alongside inclusive design of fixtures and fittings, can increase the level of independence experienced by people with a disability when preparing meals, undertaking personal care tasks, and receiving health and medical support when required.

Increasingly new technologies are helping to facilitate this more effectively, using monitoring systems to ensure that medicines are taken on time and that the individual is safe, and utilising technologies such as robotics to help with self-feeding and even aspects of personal care such as dental hygiene. Such interventions are important in decreasing the extent to which an individual is dependent on a family member or carer to assist when required. This can increase the level of self-esteem and allow the individual to have control over the timing of when care tasks are undertaken.

Control

Technology should also be used to establish control within the person's environment. At a simple level this might include controls for TV, Radio, other entertainment systems, air conditioning, or lighting and remote systems through which doors, windows and curtains or blinds are controlled. Many such technologies are now available and integrated through a smartphone.

Increasingly the use of new technologies such as wearables offer increased opportunities for control within the environment. These technologies are being integrated into smart homes, whereby the environment responds to the behaviours and needs of the individual. Smart homes are also utilising voice activated controls from companies such as Amazon, Google and Apple to replace traditional remote control handsets.

Current Technologies and Independent Living

Current technologies for independent living often focus upon the integration of assistive solutions into the design of the built environment. Arising from the concept of home automation, this has become known as “smart homes”. Increasingly automation is becoming an option for people with disabilities to remain in the family home rather than move elsewhere. It also reduces the pressure upon family members to respond to every need of the disabled person. Much of the technology used is similar to mainstream technologies designed for use for security, entertainment, and energy conservation but it is customised towards the needs of people with disabilities.

Smart homes include the control and automation of lighting, heating, ventilation, air conditioning and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers that use WiFi for remote monitoring. Current systems consist of switches and sensors connected to a central hub from which the system is controlled with a user interface such as a wall-mounted terminal, mobile phone software, tablet computer or a web interface, which is often integrated with cloud based services.

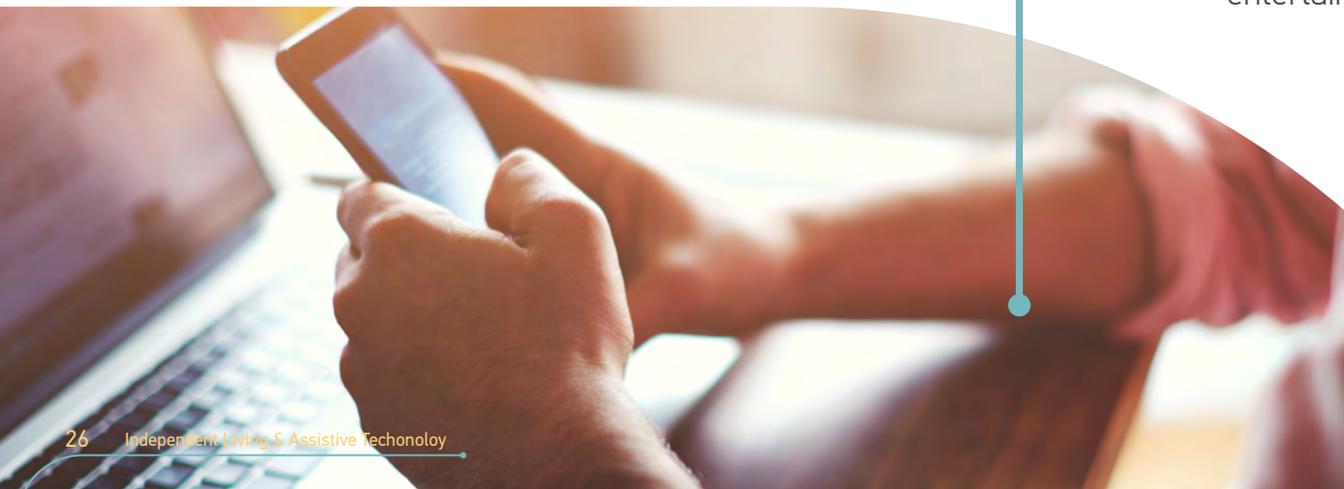
Smart homes for people with a disability

Smart Homes offer a range of benefits to people with a disability – safety, security, comfort and independence increasing the opportunity to stay within the family home if preferred. The broad concept incorporates the notion of ambient assisted living (AAL) – the methods, concepts, systems, products and services which assist people with disabilities in daily living.

In the West, an aging demographic challenges the future of healthcare systems, and AAL is part of the solution to that. As people age and become disabled, many wish to stay in their own home, alongside family members if possible, while retaining autonomy and independence.

For these economic, cultural and social reasons, smart homes and AAL are rapidly being implemented. Currently, there are smart home solutions that control the environment within which the person with a disability lives. Not only the heating, lighting and appliances, but also the volume of a doorbell, whether a window has been left open, or starting a washing machine at the most suitable time.

By extending smart homes to include appliance automation, it is possible to program and control a range of devices such as coffee maker, refrigerator, oven or hob, offering people with a disability significant opportunities for daily lives and which can be applied to entertainment systems such as music, films or photography.



Integration of Mobile and Portable technologies

Mobile and portable technologies are enabling increasing levels of personalisation in the field of smart homes. There are three common terms used:

- Telehealth, involving remote patient monitoring, such as using point-of-care technologies to monitor a patient's well-being and health.
- Telecare, to help vulnerable people to live independently in their own homes via the use of sensors with 24-hour monitoring and response.
- Assistive, or personalised, technology, referring to personalised equipment, which is used to meet daily needs including mobile technology or communication aids.

Mobile and portable technologies are increasingly the basis of the integration for the person with a disability of the technologies within the smart home. Almost of the functionality of a smart home can be controlled through a smartphone, using a range of sensors and controls installed within the house. The applications made available by the smart home provider can be designed to use the same assistive technologies as the person with a disability uses to write, browse the web and study such as a screen reader, switch or voice recognition.

The smartphone has the additional advantage of allowing that control to take place from beyond the home as the sensors, controls and smartphone are linked together by the internet and WiFi.

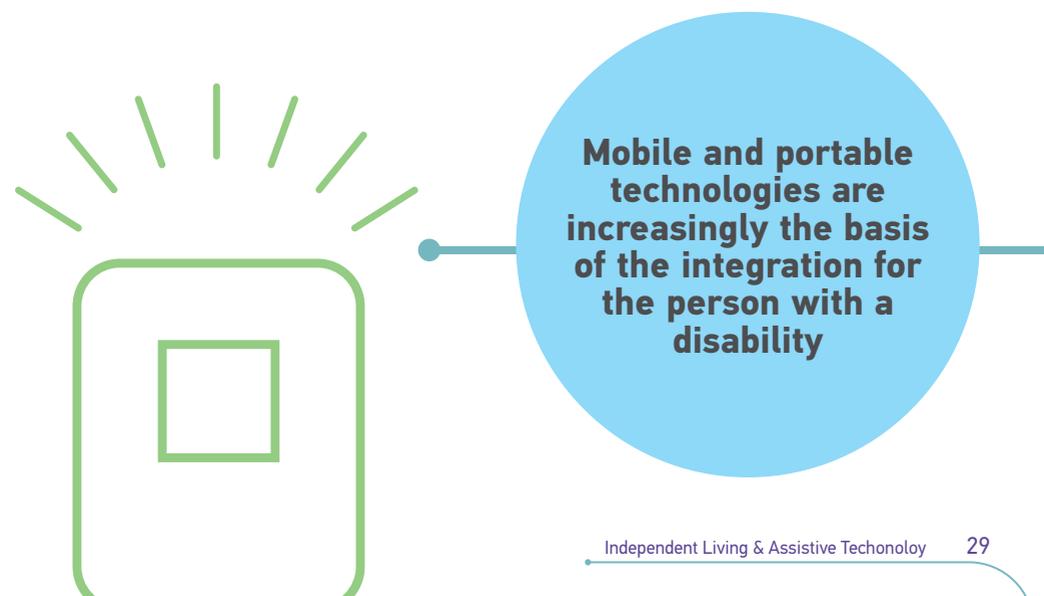
It is increasingly clear that for current smart homes, smartphones are the preferred means of control for many people with a disability. It is impossible within this report to outline all the possible ways in which a smartphone can be used in this way. However, some examples are provided to illustrate the point. We have sought to avoid making specific reference to individual products, as they may not be available within the Middle East marketplace.

Home security from your smartphone – Automated security technology allows monitoring of your home from a smartphone. Systems can provide a panoramic view of the home and notifications if any unusual motion is detected.

Answer your door from anywhere – It is not always quick and easy for a person with a disability to get to their door. Using a WiFi enabled doorbell camera that allows the person with a disability to video chat with visitors through their smartphone, this can be especially useful when deliveries are made as anyone making a delivery can be informed that it is safe to leave the delivery at the door.

Remote control of home electronics – By using a smart power outlet, it is possible to control electronic devices using your home WiFi network. This could include switching on the air conditioning, heating, or turning on lights in the dark.

Adjusting a thermostat from anywhere – A programmable smart thermostat can allow control of the settings from a smartphone. The automation technology can learn to pre-heat/cool your home based on user habits ensuring comfort.



Get real-time data on smoke and carbon monoxide levels –

Fire and carbon monoxide are two of the biggest safety hazards in your home and it is valuable to monitor them from anywhere. Alarms are available that synchronise with a smartphone to alert a carer or the person with a disability if the smoke or carbon monoxide alarm goes off.

Lock the door remotely – Products can provide the person with a disability with a virtual key for their main entrances. With this technology, locks can be controlled from anywhere with a mobile device. This can allow the person to open the door remotely to visitors, including times when they are unable to reach the door. It can also allow the person with a disability to allow visitors to their home when they are elsewhere, such as trusted maintenance workers or friends.

Control lights and blinds through a single device – Technologies allow the user to control multiple devices in their home through a single app. Increasingly technology integrators are making this possible. Through partnerships with specific products a single app can be used to control them all offering further simplicity of automation and control.



Health and Safety

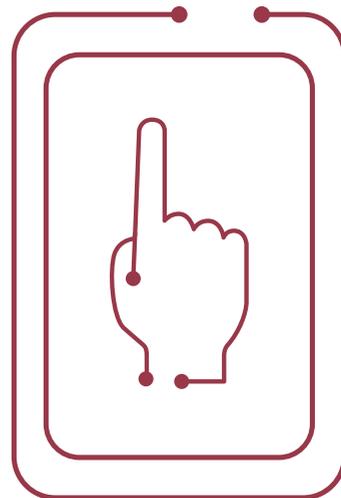
Ambient Assisted Living products also include communication devices for people with disabilities such as emergency call systems, fall sensors, motion detectors, or telemonitoring. Currently development is taking place to create telehealth services that incorporate medical prevention, diagnostic and therapies.

The Telecare Services Association definition of Telehealth is:

“Telehealth is the remote exchange of data between a patient at home and their clinician(s) to assist in diagnosis and monitoring typically used to support patients with Long Term Conditions. Among other things it comprises of fixed or mobile home units to measure and monitor temperatures, blood pressure and other vital signs parameters (and the answering of targeted questions) for clinical review at a remote location using phone lines or wireless technology.”

The ability to use technology to provide services that assist in the management of long term health conditions allows people with a disability to consider options for daily living that do not place their health and well-being at risk. In the past decisions may have been taken purely because of the need to monitor the condition of a person on a 24 hour basis. Technology which allows health conditions to be monitored regularly and to identify issues before they become critical is very supportive of independent living. Such technologies operate by monitoring vital signs, such as blood pressure, and transmitting the data to a telehealth professional, where it is monitored against parameters set by the individual's clinician. Any evidence that vital signs are outside of 'normal' might indicate an emerging health need and triggers a response.

There are many forms of telehealth products that can be used to develop a service package that is tailored to personal health needs. Increasingly such technologies can be linked to simple wearable technology and connected to a smart phone and provide the basis of fitness and activity monitors as well as clinical tools.



Wayfinding and mobility – Location Based Services

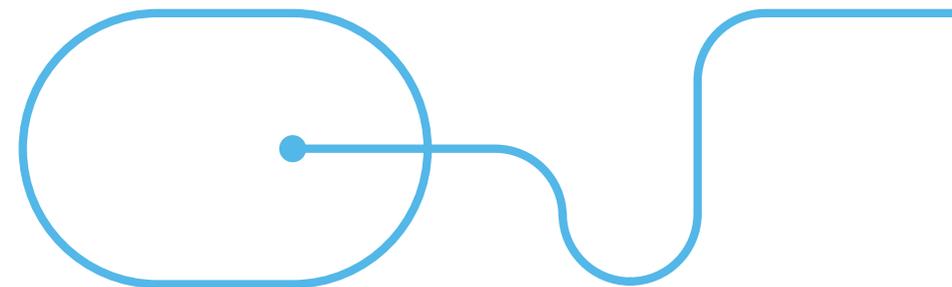
The ability to safely and independently explore a new environment goes a long way in improving a person's quality of life. Without the use of visual information, exploring unfamiliar environments can sometimes become a hazardous task for people who are blind or visually impaired.

Initial technologies that provided turn by turn navigation for people with little or no vision included the StreetTalk GPS and Trekker. Both demonstrated the need for such technologies and that a market existed for providing automated speech-based detailed directional instructions including information about junctions and also provide an exploration mode which can be used either online or offline to traverse through locations of interest using the arrow keys on the keyboard.

Location-based services and wayfinding technologies have increasingly been integrated into mobile and portable platforms such as phones and tablets. Apps such as Google Maps offer turn-by-turn navigation with speech output for transport by car and when walking, and specialised versions of these apps have been created for the particular needs of blind people.

Wheelmap and Accessible Qatar locate the user and recommend nearby accessible public locations such as restaurants. BlindSquare makes use of data from FourSquare and Open Street Maps to help the user locate stores and cafes around them. Loadstone GPS, Mobile Geo and Seeing Eye GPS are further examples of GPS-based systems that function as navigational aids for the visually impaired in outdoor environments.

The Seeing Eye GPS is a fully accessible GPS product for the iPhone. It is a fully accessible turn-by-turn GPS iPhone app with all the normal navigation features plus features unique to blind users.



Technology Trends in Independent Living

The development of the Internet

Current trends suggest that we can anticipate a significant expansion of connected devices into the home. As suggested earlier, it is already possible for people with a disability to connect and interact with a range of devices. Increasingly the technologies within our home can share data and information to the user and to each other, with control being provided through a smartphone, smart watch, or home hub (like Google home).

The sharing of data between devices might facilitate independent living in new ways. For instance, by following a recipe on your tablet and wifi enabled kitchen scales, notifications are sent to the oven of the time you want the food cooked for, the oven is set to the correct temperature and time for the meal and notifies the person with a disability when it is ready, reducing the oven temperature to avoid over cooking or burning the food. For a person with dementia, the data from a video door entry system could be face-matched against their contacts, and information given to the user as to who they are and when they last met.



Perhaps the most important development in this field is that increasingly the hub of these connected devices will be able to learn from the person's behaviour and adjust the environment according to those habits and needs. For instance, by reading the diary of a person with a disability the system will be able to recognise that, to be at work by 8am, the hot water and shower need to be turned on, the temperature adjusted to a preferred level, and an alarm set for 6.30. The system will understand which day of the week it is, and adjust for different personal schedules at the weekend.

The gradual introduction of artificial intelligence into the system can also enhance independent living in other ways. For example, sensors can identify when the person is running out of daily living essentials, and arrange for home delivery with an approved supplier. Then, when the delivery arrives, the delivery man can be given a one-time code to enter the house and place the items into an appropriate place.

In understanding the potential of the Internet of things we need to understand the scale of the technology and the data it generates. However, we should also be aware that there are barriers and concerns regarding accessibility, standardization and privacy that will emerge.

The impact of Wearables

The move towards wearable technology is also gathering pace. As the population has increasingly embraced the concept of having their technology with them at all times, through smartphones, so new technologies have emerged that aim to make things easier to access. Already consumer electronics are equipped with a range of sensors, mostly targeting the health and fitness markets. Fitness trackers are used by many to monitor the number of steps taken, to measure heart-rate and quality of sleep, and more recently blood pressure and sugar levels. Such data can be shared with a health provider, triggering warning, advice or medication and arranging a visit if required. New uses of wearable technology are also emerging, and

increasingly these options have the potential to assist people with a disability to achieve greater independence. Whilst not all have yet reached the market, they do suggest some of the ways in which wearable technologies are being designed to meet special needs.

- A jacket for people who are deaf to “feel” music.
- A watch designed in collaboration with the vision impaired. Instead of traditional watch hands, time is indicated by two ball bearings that are connected by magnets to a watch movement, indicating minutes and hours. If the ball bearings are displaced, the magnets will move the bearings back to the correct time with a shake of the wrist.
- An app that works on a smart watch to use tactile and visual alarms to inform a person with hearing loss of important sounds in their environment.
- An assistive mouse that helps people control electronics without using their hands.
- A wearable for those who have diabetes. Using non-invasive methods for testing glucose levels in the blood it connects to an app to provide the user with real-time glucose readings, and an easier way to manage their logbooks and analyze health patterns.
- A wearable for autistic children which measures and tracks anxiety to help them better understand behaviour and prevent anxiety attacks.

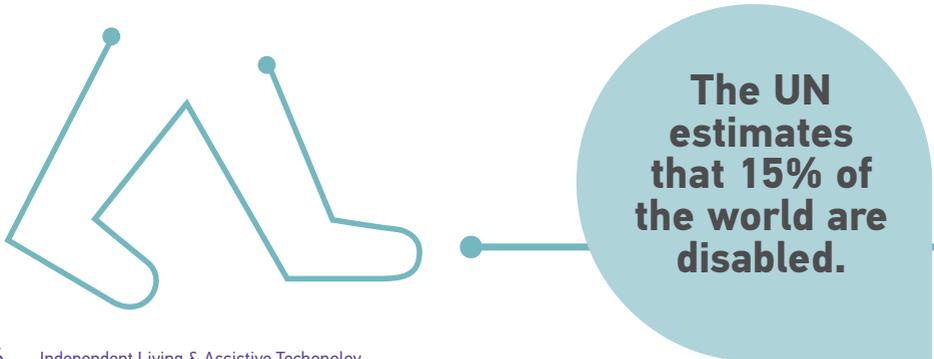
Wearable technology has the potential to help people with a very wide range of needs. We can anticipate seeing more applications in the immediate future as the technology becomes cheaper, smarter, smaller, and more accessible.

Mobility – The advent of autonomous vehicles

The UN estimates that 15% of the world are disabled, amounting to one billion people. With estimates in individual countries ranging from 10-20%. For many of these, transport is a key issue. Those with some physical disabilities often cannot learn to drive cars, and others with conditions such as epilepsy often are not allowed to drive if they have had a seizure in the previous 12 months. This means that public transport is essential for them. However, in many cities public transport is of limited quantity and quality, and many aspects of public transport are still not disability-friendly.

This can mean that those with disabilities often do not enjoy the independence to travel independently, leading to a sense of isolation and confinement. Challenges in transportation, and the costs of having to depend on drivers to get to work, is an important contributor to many disabled people being unemployed.

Announcements of tests of semi-autonomous vehicles around the world are now frequent. Many believe that autonomous vehicles are an important development in reducing social isolation for people with a disability, reducing the need for drivers and accessible public transport. Existing vehicles already feature autonomous features such as assisted parking and collision avoidance, and it is anticipated that autonomous vehicles will be widely adopted by 2040.



The UN estimates that 15% of the world are disabled.

Awareness of this opportunity for people with a disability is growing as public campaigns have been launched to ensure that the needs of disabled people are considered when planning is taking place.

As a result, manufacturers are increasingly becoming aware of the capacity for the technology to enhance the lives of people with disabilities.



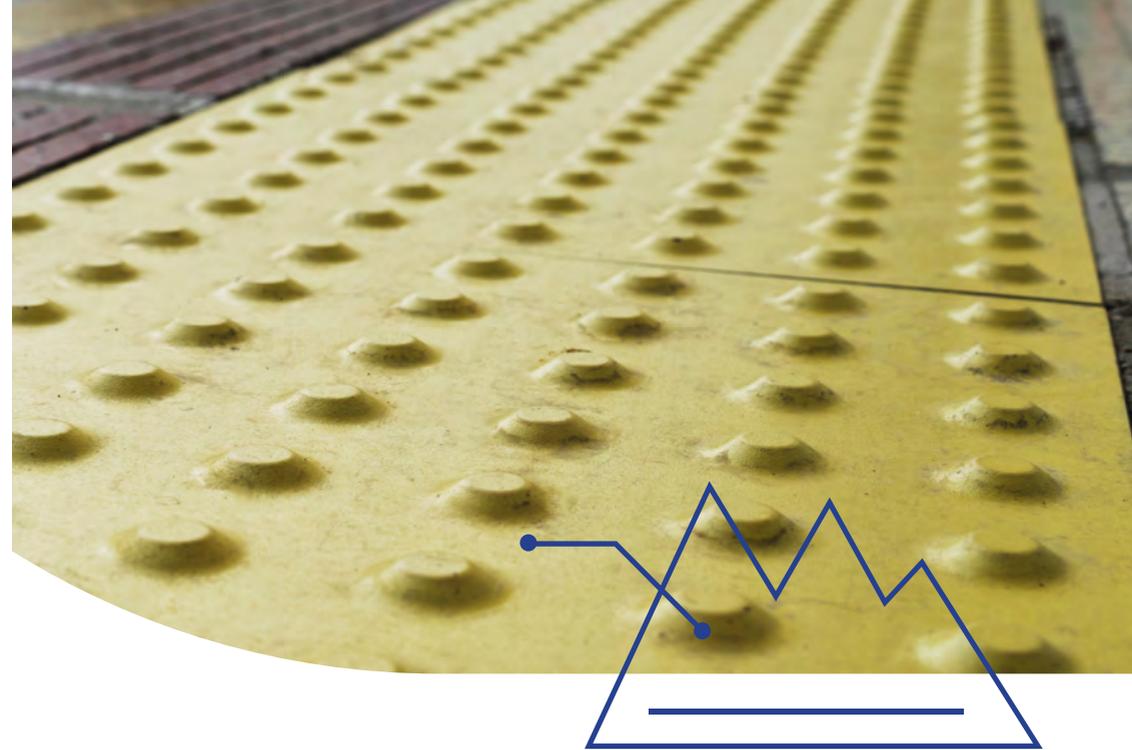
Building Inclusive Environments – Smart Cities and Independent Living

Understanding Smart Cities

A smart city is one that extensively uses connected devices with the specific aim of delivering services as sustainably and efficiently as possible. By connecting accessible homes to inclusive public buildings, and addressing the spaces between them, we begin to build the concept of an accessible smart city. There is a rapid worldwide growth in Smart Cities, but the speed of such growth could lead to a new digital divide for persons with disabilities. To ensure that all citizens can take advantage of the opportunities that such initiatives bring we need to take care to integrate accessibility and universal design into Smart Cities programs.

Governments that deploy accessible technology in their Smart Cities initiatives will have more innovative, equitable and impactful results across key program areas, including e.g. in education, healthcare, and transportation. Technology companies that include accessibility and inclusion as part of serving Smart Cities worldwide will have an edge over competitors that do not. They will be providing products and solutions that support rich, personalized, citizen-centric services that serve a broader population and are usable in a wider variety of environments.

Smart cities seek to leverage digital data gathered by a wide range of connected sensors to automate many of the time-consuming tasks that are undertaken. These routine tasks contribute to cities being the crowded, and inefficient places that they appear. It is the integration of personal data with public data that offers potential.



For instance, personal data would inform us of the average length of time it takes for a person to get from their home to the metro station; and public data would inform them of when the next metro will reach their stop, allowing them to plan precisely when to leave home with a little time spent waiting for a train at the metro station. Similarly, if using personal transport technology, the combination of personal and public data could allow a driver to find where the nearest accessible parking place is to their location and even book that space in advance when they are within a given distance of it.

Such technologies reduce congestion and frustration thus improving quality of life. If we add autonomous vehicles into the equation, the disabled “driver” could be taken directly to an accessible parking spot within easy reach of the building they wish to access simply by entering a desired destination into an app.

Some of the concepts underpinning a smart city are already in place. Boarding passes are delivered to your phone, reducing time spent in airport queues; notifications that your restaurant table is available arrive by SMS; and the arrival of your taxi is announced by an app. Increasingly, our services are made available to us on demand, without the need to spend long periods in waiting rooms and queues.

Demographics suggest that increasingly our populations will live in cities, that the number of people living in those cities will have a greater number of older and disabled people, and it would appear obvious that such cities will need to use the potential of technology to accommodate those needs. To achieve this, urban development needs to engage with people with a disability to understand their needs and plan for them effectively, seeking to enhance a supportive personal environment at home with accessible mobility and inclusive public spaces. Smart cities will need to be founded upon such an end to end approach to fully include citizens and residents with additional needs.



Recommendations

As part of this guide, we have made further recommendation for actions required to address the practical issues and the wider need to ensure that solutions have the desired impact. These are divided into general and specific recommendations.

General Recommendations

To maximise independent living and quality of life efforts should be undertaken to:

- Enhance awareness to change the status of people with disabilities in society.
- Empower people with disabilities by supporting self-advocacy, employment and access to education.
- Strengthen families by establishing support groups for parents and families of people with disabilities.
- Make information accessible. Publish a guide in clear, simple Arabic which defines the rights of people with disabilities. In addition, promote the establishment of centres to provide information, counselling, and guidance.
- Improve physical accessibility to localities, institutions, and organizations that provide care to people with disabilities, as well as accessibility to public places and businesses in general. This can begin by involving people with disabilities in the planning of public buildings through local committees. People with disabilities can also serve in an advisory capacity during the actual building phase of public projects.
- Develop services and opportunities for increased communal involvement. Establish inclusive social clubs to promote accessible activities held in the community. Support entertainment and leisure activities that are appropriate for people with disabilities and establish further rehabilitation centres with workable transportation options.
- Create forums and coalitions to engage with people with a disability to give voice to their aspirations.

- Establish an agency for the provision of trained support workers and personal assistants for persons with a disability and their families.

We suggest that assistive or personalised technology has a central role in modern social care, which should strive to encourage choice, control and focus on the needs of individuals.

Recommendations for Ambient Assisted Living Services

Ambient Assistive Living products and services are defined as those that combine new technologies and the social environment to improve quality of life. To address this sector we recommend that:

- Map and secure the sources for the provision of fundamental assistive living products, to ensure that persons with disabilities have a technology baseline upon which smart home technology can be provided.
- Maximise available information about sources of support for the fundamental assistive living products.
- Support and fund pilots for the provision of ambient assisted living products to evaluate:
 - o the extent of increased choice and control in decision making about lives.
 - o its impact upon maximising personal, health and social care budgets.
 - o the comparison of use of products in a variety of care settings.
 - o the levels of dependency of long-term use of products on support staff and their roles.
 - o the levels of dependency of long-term use of products on support staff and their roles.
- Engage with universities to establish a valid pilot project upon which an evaluation can be based.

We believe that these recommendations provide a firm basis for the design and implementation of an assistive and independent living strategy.

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