

مدا mada

مركز
التكنولوجيا
المُساعدة
قطر

qatar
assistive
technology
center

“Touch Screen Technology”

Mada Assistive Technology Center

Tel: 00 974 44594050

Fax: 00 974 44594051

Email: info@mada.org.qa

Touch Screen Technology

Introduction

In the recent past we considered using technology required that we sat in front of a computer monitor and used a keyboard and mouse. The advent of iPads, Tablets, Smartphones and other mobile devices is changing how we use technology on a day to day basis.

Similarly for people with a disability, using technology need no long be as we considered it in the past. The computer mouse and keyboard have become so familiar to all of us that it has almost become considered the standard way to use computers. So much so that when we ask someone with learning difficulties or disabilities to use a computer we seldom think about the complexity of the task we are asking them to do.

Just operating a mouse involves complex motor sequencing and spatial skills. For some software the mouse skills may be at a higher cognitive level than the program they are trying to use. Substituting a different device such as a roller ball may make the physical task easier but will not simplify the cognitive task.

The built in touch operation provided by Touch monitors provides a direct, consistent and accurate alternative to a mouse especially for the many programs that are operated by “point and click”. These are similar to the screens used commonly for interactive displays at places like airports and museums where simplicity and durability is the key requirement, just as in the classroom. The user is free to concentrate on the program rather than having to think about how to work the computer.

How do touch screens work?



A touch screen is a computer display that is sensitive to human touch. Touch screen allows the users to interact with the computer by touching pictures or words on the screen.

A touch screen display may also be defined as one that is sensitive to the touch of a finger or stylus. Touch screen are used in many locations for many different purposes, including ATM machines, retail

point-of-sale terminals, car navigation and industrial controls, the touch screen became wildly popular for Smartphones and tablets after Apple introduced the iPhone and iPad.

It is used with traditional sized monitors and also is ideal technology for use with tablets like the iPad and smart phones. For portable devices this makes the screen area larger removing the hardware keyboard, this can be of particular benefit for people who need to use their iPhone or Smartphone as a communication device or to access information, such as map directions etc.

Touch screens offer several advantages; the primary one being the infinite ways the user interface can be designed and changed compared to a fixed set of physical buttons. If there is no hardware keyboard on the unit, a "soft" or onscreen keyboard can be displayed on screen whenever text must be typed in. Touch screens are also able to accept hand printing, handwriting, graphics and finger movements and they can be made resistant to harsh environments.

The two main types of touch screen are referred to as Resistive and Capacitive are

Resistive

Resistive screens are pressure sensitive and can be operated with a finger, stylus or just about any pointed object. They use two active layers: a flexible plastic layer on top of a rigid plastic or glass layer, with insulated spacers in between. The layers are coated with indium tin oxide, and different voltages are applied across the coatings, typically alternating between the layers. When touched, the front layer picks up the voltage from the back, and the back layer picks up the voltage from the front, enabling the controller to determine the X-Y location.

Although the least expensive, the resistive method blocks up to 30% of the light from the CRT or LCD screen due to the multiple layers and coatings.

Capacitive

a capacitive touch screen uses only one active layer: a metallic coated glass panel, thus allowing more light to come through. Voltage is applied to the corners of the screen, and when a finger touches the screen, it draws a tiny amount of current. The controller computes the X-Y location from the change in capacitance caused by that touch point. Because the human body absorbs current, either the finger or a "touch pen" that transfers electricity must be used, but not an ordinary plastic stylus. This method is

also commonly used by touch pads on laptops to control the mouse.

Who can benefit?

People with Physical Difficulties

Since touch screens were designed to provide user-friendly, intuitive computer access without requiring a keyboard and mouse, it logically follows that touch screens can be excellent tools for people who experience difficulty using keyboards and mice because of physical disabilities. Many computer resources that previous were unavailable to this group now are readily available. Learning can be more fun and interactive using the touch screen. It allows users to focus on learning applications as opposed to have to learn how to use the computer hardware. Children can be helped improve their motor skills by using fun software.

Children and Adults with Autism



Cause and Effect relationships are more obvious with a touch screen and using applications requires less concentration. This is particularly helpful for learners along the autistic spectrum who can have difficulties understanding the abstract relationship between mouse actions and the resulting actions on the screen. The concrete relationship between what the child sees and what the child directly activates is established using a touch screen and without the distractions of mouse, switch or keyboard the user is helped concentrate on the program and not fiddle or play with the input devices. There are many apps available for the IPAD that can serve to improve communication for autistic children and games to improve concentration.

Proloquo2go is an example of an application based on touch screen technology. It is a communication tool for those who have difficulty speaking. It can be used on the iPad, iPhone and iPod Touch. It can be used as a communication tool for children or adults with autism, cerebral palsy, Down syndrome, developmental disabilities or aphasia.

Children with Learning difficulties

Those with cognitive difficulties who may have difficulty with hand to eye coordination find it much easier to use a touch screen. Attention is focused on the learning task not on the mouse. These users who tend to lose track of the mouse pointer find it much simpler as they do not lose track of their fingers.



Many companies provide applications that are motivating and useful for people with learning difficulties. Applications such as the example given called “Targeting –peeping musicians” it is designed to improve observation skills and touch targeting produced by Inclusive Technology in the UK however there are many many more applications available from various companies that can be used to improve literacy , numeracy and hand to eye coordination.

People with Visual Impairments

Interaction with ‘point and click’ software is greatly simplified. The user does not have to search for a pointer on the screen, find the mouse and then move the pointer without losing track of it. Instead they just touch the screen.

Group Work

The task at hand no longer needs to be dominated by the person who has control over the mouse. Everyone who can reach the screen can take part in activities. This can be very useful for improving turn taking, team work and for social interaction. It is also more fun for all.

As touch screen and portable device become more common and more affordable, the range of applications increases. Many of the potential applications are ever changing and should allow people with disabilities to take full advantage of these in the future.

Problems encountered by disabled people and the ageing population using touch screens

People who are blind and partially sighted

As touch screens do not provide tactile cues in order to activate a control, blind and partially sighted users rely on touch screens that have the ability to provide audio clues for the location of the control. One such development in this field is describes as the "Talking Fingertip Technique". Smartphone manufacturers have had to work at providing a range of solutions to make their devices accessible, such as Voiceover™, available with Apple products.

Patterned backgrounds or an image in the background reduces the legibility of the text. Flashing, scrolling or moving text also creates significant problems for people with low vision, as the reader's eyes have to move at the same time as focusing on the text.

People with Hearing Impairment

Hearing impaired users cannot identify commands or controls that require hearing, so visual or tactile feedback when controls are touched would be recommended. Many touch screen systems, particularly tablet or PC based systems do not provide this functionality, however this is seen more and more on portable devices and on Smartphones.

People with a Physical Disability

A person who has lost an arm or a hand may be using a prosthetic device. This may result in insufficient control to be able to accurately point at and press buttons or keys. Also, the prosthesis may be made of metal, plastic or some other material with dielectrics properties that are different from those of a human finger, therefore a touch screen will have to be able to detect this other material in order to react to the user's inputs.

Cognitively impaired

For those with cognitive impairments, labels that are made to look like controls can cause confusion. If screen designs and controls are constantly reconfigured so the design is flexible, this can render them difficult to use for cognitively impaired people, meaning that they are not given a chance to learn where the controls lie and what their associations are.

Ageing population

Elderly people often experience changes in vision, hearing, dexterity and understanding as they age, therefore, they may encounter issues with identifying the location of controls on the touch screen and being able to comfortably activate controls.

Some Practical Recommendation for Using Touch screens

Finally some points to consider when thinking about the accessibility of touch screen for people with a disability. Some of the points below refer to touch screens on smart phones and PC's, whereas some refer to guidelines for the use of touch screen public terminals such as kiosks, ATM's etc.

- The touch screen should be shielded from sunlight to ensure optimal visibility
- The screen should be angled towards the horizontal to provide arm/wrist support
- The screen should be perpendicular to the line of sight
- The text and background colour combination should have high contrast
- Avoid shades of blue, green and violet for conveying information since they are problematic for older users
- There should be no noticeable flicker on the screen
- Structure the visual display layout so that the user can predict where to find required information and how to use it
- There should be high contrast between touch areas, text and background colour
- Text or controls should not be placed over a background image or over a patterned background
- White or yellow type on black or a dark colour is more legible, provided that the typeface, weight and size are suitable
- Controls are labelled in a large high contrast font
- The system must be error tolerant by providing a clear unambiguous control that permits the user to go back a step
- Position controls on the screen in a way that is consistent with functions
- All labels and instructions should be in short and simple phrases or sentences. Avoid the use of abbreviations where possible
- Provide text versions of audio prompts that are synchronised with the audio so that the timing is the same
- Speech output of instructions, as an addition to (and not a replacement for), on-screen instructions, is recommended

The above list is by no means exhaustive, but rather meant to act as a prompt for considering the accessibility of touch screen systems for people with a broad range of abilities and disabilities.

Summary

As outlined in this Factsheet, the proliferation of touch screen solutions on common technology and devices used in everyday life has offered a range of opportunities that previously did not exist for people with a disability. Prior to the advent of touch screens, being unable to use a keyboard and a mouse often meant that you were unable to use technology at all.

However, we must be cognizant of the limitations of touch screens and continue to be aware of the barriers faced by people with a disability who may be reliant on these to access technology.

For further information contact the MADA Qatar Assistive Technology Center, 7th Floor, Al Nasr Tower B, Al Corniche Road, West Bay, Doha, Qatar. P.O. Box 24230. Ph: +974 44594050

“This work is licensed under a [Creative Commons Attribution-ShareAlike 3.0 Unported License](#).

We request attribution to Mada and all other authors of original materials is retained”