# Our current approach to accessibility needs to be rethought, reformed, and reimplemented to deal with (and take advantage of) next-next generation technologies

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## Abstract

The current approaches to ICT access work moderately well for today's and near-term technologies, but will not work for many of the next-next-generation interface technologies. In addition, Current approaches have proven ineffective at addressing the needs of some (large) populations of people facing barriers particularly (but not only) those with cognitive, language, and learning disabilities.

Emerging interface technologies will require a new approach to accessibility. But they also can provide new capabilities and opportunities for providing access that goes beyond what is possible today, providing better access and access strategies that can address those we cannot address well today.

A new model is proposed that calls for a new contract between companies, governments and consumers – shifting the locus and focus of interface accommodation from companies to those with the expertise to address the different barriers to ICT faced by users. It taps emerging technologies to create the ability to significantly reduce the need for special APIs creating more powerful adaptive interfaces that can directly work with mainstream interfaces. In additional to reducing effort by industry, this new approach also has the potential to greatly increase the prevalence of accessibility in standard mass market ICT – which, by itself would justify looking at the approach given the low uptake using the current approach.

It would require investment by governments and industry but would provide net saving to industry and better and more individualize interfaces for users requiring more diverse interfaces. It would also provide better interfaces and solutions for a wider range of people facing barriers to ICT use than we are able do today, including people facing barriers due to their disability, the language they know, their language skills, their digital literacy, the effects of age and more that we cannot address well today.

This process can begin gradually using evolving AI technologies with immediate benefits to many unserved and underserved groups, and evolve with time.

**The Problem – Part 1: Current approach**

The current approach to accessibility requires that authors/developers a) make their products directly accessible to some individuals, and b) provide points of attachment/access for assistive technologies for those users they cannot reach with (a). This is the best we could do today and works pretty well for many users when it is practiced. Problems with it include:

- It requires all companies try to accommodate all of the different types, degrees, and combinations of disability. **And not just disability,** but also the barriers people face due to their language, digital literacy, literacy, age and more.
- Compliance / uptake of the current accessibility guidelines and practices is spotty at best.
- The reliance on assistive technologies, works for some disabilities but not for others including perhaps the largest group -- people with cognitive, language, and learning disabilities.
- The effectiveness of these built-in accessibility features is limited by the knowledge of the development teams. And the cost to train and retrain is high.
- Much good work and progress has been made – but many users are still left out. And this is happening at a time when access to ICT is essential to education, employment, health, civic participation and almost any activity in life.
- Even for groups where access is perceived to be better such as those who are blind – todays access usually leaves out those with lower digital literacy skills or ability to handle more abstract concepts, hierarchical information presentation, or interfaces that are unfamiliar and changing.

In short, accessibility has come a long way, but practice is still low, spotty, and does not address many of the larger user groups well or at all for today's technologies. And it cannot address what is coming.

**The Problem – Part 2: Next-next-generation technologies**

Next-next generation technologies (those we will be using in 20+ years) will look quite different from todays. Today's interface techniques will not disappear, but the way we present information to users and the way they interact with it will expand in ways our current approaches cannot handle.

Some of us…
- …will be using not just voice, but conversation to interact with ICT
- …will use both natural and abstract gestures
- …will use virtual & augmented reality displays for both real world augmentation and for abstract visualization
- …will be using "liquid-hardware" interfaces that present physically tactile dynamic interfaces. Some real. Some just perceived as real.
- …will use direct brain interfaces to present/perceive information:
  o initially as presentations that appear as coming through our senses

- later as "extra-sensory information presentation" that does not "look/sound/feel" like real world presentation but is "interpreted" information; presentations that feel like intuition or just knowing without "sensing" via our senses.
- …will be able to 'will' things to happen without thinking about movement of any of our physical body, or indeed physical movement of anything.
- …will merge with external (or internal artificial) systems that augment, extend and reinvent our abilities to perceive, understand, remember, find, operate, and do.

Much of this sounds like science fiction, but technologies along all of these lines are advancing rapidly, and will be here sooner than many of us realize. And, of course, much will be quite different than we imagine, or than we even can imagine.

As this occurs, some of us, those that can use these new interfaces, will extend our abilities to perceive, understand, and operate/act. However, these technologies/advances will not be available equally. They will also not work for everyone in the same way, and we will still have people facing barriers. And our current approaches and strategies will no longer cover all of these, be effective, or even, in some cases, apply. For example, what is the text equivalent of an induced perception in the brain that is not linguistic?

**NNG technologies will also provide new tools / capabilities as well**

On the flip side, these technologies have the potential to provide new tools and opportunities.
- People who cannot process visual information may be able to process virtually visual information presented directly to their brain.
- People who have poor physical control through their neuromuscular system may find direct brain control of input devices - or direct injection of information to be better for them.
- People with cognitive, language, and learning disabilities who find the standard presentation of information to be difficult, may find that alternate presentation tuned to their abilities, (or presentation though alternate senses) works better for them.
- The ability of AI to process, understand and re-present information may allow information to be presented at different levels to match each individual's abilities.

**Proposed new approach and contract**

Proposed for discussion and debate is a new approach that calls for an investment in the creation of better tools that can work directly with mainstream interfaces as input, understand and operate them, and then re-present the mainstream interface to those who cannot use it, in a form that they can perceive, understand, and use.

Rather than trying to create interfaces that are usable by all, developers would create interfaces that were operable by mainstream users (and these *mainstream-interface-interpreting* tools). This is an extension of the assistive technology model – except that

instead of having to provide special APIs for the assistive technologies, these tools would be able to work directly with the mainstream interface.

In exchange for not having to train all of their teams in how to handle more severe disabilities, companies would help support the development of these tools that take the mainstream interface and provide an API to special interfaces.

This would not mean that those users who can be accommodated directly through flexibility of the mainstream interface should not still be able to use the mainstream interface itself.  But it would provide an alternate approach for individuals who need a different type of interface from what can be provided with a mainstream interface including those we do not know how to address through mainstream interface flexibility.

**One example of such an approach**

One example of this would be the combination of a general purpose '*Info-Bot*' with 'individual user interface generators'.   The Info-Bot is defined as an information robot that is capable of understanding and operating any interface that can be understood and operated by the 50th percentile user. That is, if the interface can be understood and operated by 50% of the population, then the interface could be understood and operated by the Info-Bot.

The public Info-Bot would then feed '*individual user interface generators*' that would each be designed by consumers and specialists to work one or more of the many different types of people who have trouble with standard interfaces.

- Companies would focus on making sure their interfaces could be used by 50% of the population (and the Info-Bot).
- Accessibility, literacy, digital literacy, aging etc. consumers and specialists would focus on developing optimal interfaces for the different types, degrees and combinations of abilities/barriers experienced by their populations. Using the same advancing interface and processing technologies discussed above, new and better ways to present information (and control) can be devised, that would never be practical to include together in a mainstream device.
- And the mainstream device/system developer would not need to understand how to interface to this wide variety of users, needs, and abilities.

**The Interim between now and next-next-gen**

We cannot jump directly from the current model to the new. The new approach is different enough that it requires re-thinking our contract with industry, government, and consumers quite dramatically.  It also requires the development of new technologies that do not exist. We can evolve to it though, starting with the development of better interfaces using these emerging technologies and connecting with precursor of an Info-Bot that can eliminate the need for some APIs by replacing them with an elementary Info-Bot component-function that can take part of the mainstream interface as input and provides an API or APIs as output.

**Note**

The concepts presented here are preliminary and intended to begin a discussion – about the limitations of current approaches and technologies, the potential new barriers of next-next-generation technologies, and the potential of using these new technologies to enable a different approach to access to ICT by all facing barriers.

**Acknowledgement**