# Universal Usability:
# Past, Present,
# and Future

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# Universal Usability: Past, Present, and Future

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## Abstract

Computers are used all over the world in a variety of contexts by users with all levels of technical experience. This includes users such as kindergarteners, older users, people with various impairments, people who are busy doing other tasks (such as driving a car), and users with differing levels of education, literacy, and socio-economic means. The concept of computer interfaces that will be easy to use, for all of these users, in all of these different situations, is known as "universal usability." Making progress toward this goal requires innovations in techniques for gathering and understanding requirements, designing and developing interfaces, evaluation and assessment, development

and use of standards, and public policy, and much work in this field remains to be done. This monograph will present an overview of universal usability as it currently exists in the human–computer interaction literature, and will also present some future directions for work in universal usability.

# Contents

# 1

## Introduction

Many people use computers to access information electronically, to accomplish a variety of tasks. Computers are integrated into daily life in many ways, such as booking vacations online, paying bills, using the Internet to research health information, or even to earn college degrees online. Users with all levels of training and education, users with disabilities, the very young, and the very mature are using computers for many different tasks. This diversity makes it challenging for information and communication system designers to provide systems which will be easy to use by all, everywhere. Universal usability addresses this challenge and has the goal to design systems which enable the largest possible group of users to successfully use Information and Communication Technology (ICT) [205, 335, 337, 384]. Ben Shneiderman, a pioneer in the field of universal usability, defines universal usability in a more formal way as "having more than 90% of all households as successful users of information and communication services at least once a week" [334].

Universal usability is a concept known in other settings, and technologies like phones, televisions, or automobiles are addressing universal usability. Remote controls, mobile phone operation, and GPS

interfaces all have the goal to make people's lives easier; yet, many of these technologies have significant drawbacks. Response times can be slow, operating instructions and help functions are often unclear and not intuitive, and small buttons and screens can make operation difficult [220, 287, 289, 329]. Electronic voting machines, for example, are expected to simplify the voting process, but some studies have shown that error rates are higher when comparing voters using e-voting machines with voters using traditional voting recording methods. In addition, older users, users with disabilities, and users with low literacy levels frequently experience problems using e-voting machines. Security and privacy concerns compound the issue and make this a political as well as an international issue [44, 229, 270, 387].

Computer technology with its frequent changes, updates, and new products makes attaining the goal of universal usability more difficult [300, 320, 334]. Some critics caution that this goal may only be reached by designing for a lowest-common-denominator solution and by limiting high end innovations [149, 334, 384]. However, many examples document how special accommodations can benefit all users. The most popular example is the sidewalk curb-cut. Pieces of sidewalk were originally modified (cut-out) to provide access for wheelchair users, but it turned out to benefit many other groups like delivery personnel, people with strollers, bicyclists, and skateboarders [222, 337]. Universal usability not only benefits users with vision, hearing, or motor impairment, but also users with environmental constraints, such as users working in areas under poor lighting conditions. Another good illustration is speech-recognition software, which assists users with physical impairments, but is also valuable for users who are busy doing other tasks (like driving a car) or users with special ergonomic requirements as a result of repetitive strain injuries [170, 222, 334].

Designing for universal usability not only improves the user experience, but also has several advantages for the business community. Businesses, including e-businesses, can reach a larger audience, and are able to expand their market share. Service and non-profit organizations can experience an increased volume of visitors, as well as a more diverse group of visitors to their web sites, providing a more successful diffusion of information and better service to all [12, 222, 267, 285, 383, 406].

Researchers have identified three primary challenges in achieving universal usability: technology diversity, user diversity, and gaps in user knowledge [66, 334, 337]. Technology diversity addresses the need to support a broad range of hardware, software, and network access; user diversity focuses on accommodating users with different skills, knowledge, age, gender, disabilities, disabling conditions, literacy, socio-economic means, and others; and gaps in user knowledge refer to the need to bridge the gap between what users know and what they need to know. Addressing these challenges will improve usability for first-time, intermittent, and frequent users, and it will also stimulate innovation and promote quality [12, 205, 320, 334, 351].

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