

Assistive Technologies

4th
EDITION

Principles & Practices

Albert M. Cook • Jan Miller Polgar



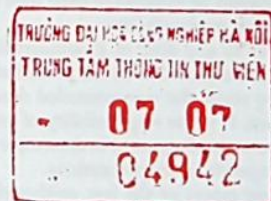
Assistive Technologies:

Principles and Practice

Fourth Edition

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*For giving us the reason and the direction for this work,
we dedicate this book to all of our students and to consumers of assistive technologies,
especially Elizabeth Cook, Brian Cook, Charles and Evelyn Miller.*

Technology is everywhere in almost everything we do.

Technology development occurs at a rapid pace making it difficult to keep current with the latest devices and software. The field of consumer technology (CT) is constantly considered to be technology designed for individuals with some form of impairment, is expanding at a dizzying rapid pace. The technology in this latest edition of *Assistive Technology: Principles and Practice* reflects the constant and rapid pace of change as well as the changing perspectives of what constitutes AT. The book is written to support students in rehabilitation, engineering, and other relevant programs and serves as a guide in the acquisition and application of knowledge that supports the provision of AT to users.

Both at the time *Assistive Technology* was originally published AT users were that perception. However, in the years since the first edition of this textbook was published, we know that it has been well received. It has content and has been translated into multiple languages. Subsequent editions such as the writing and publication of the United Nations Convention on the Rights of Persons with Disabilities by many nations and the publication of the World Health Organization Report on Disability provided AT provision and use as global concerns. Consequently we have endeavored to provide a more global perspective in this edition through a variety of practices that can be applied in different contexts and discussion of issues of appropriateness and assessment of AT across a variety. The rapid development of CT applications for consumer technologies has also made AT more accessible to underserved countries. These topics are evident throughout the four chapters discussing the Human-Autistic Assistive Technology (HAAAT) components, ethical issues in AT and AT service delivery, as well as in the discussion of different categories of AT.

Assistive technology service delivery is aligned to the principles that are clearly articulated in this book. Earlier editions contained these basic principles describing a person-centered approach, focused on functional outcomes supported by evidence, to which we have added two more including ethical and sustainable service delivery practices. We have endeavored to make the application of these principles more explicit throughout this edition in the description of the elements of the HAAAT model and the service-delivery process and in the discussion of categories of AT. Chapter 1 contains foundational ideas for the subsequent chapters in

the book, applying the HAAAT model and service in this introductory chapter.

The HAAAT model guides assessment and evaluation of AT use by clients. It provides a framework for assessing the usability of technology and guides service research and development. The basic structure of the HAAAT model remains unchanged from earlier editions. However, in this edition, we have provided considerably more depth to the discussion of each of the model's elements. Furthermore, we discuss how the elements interact with each other and how they support a team doing so, a unity in diversity using AT. A feature of this second significantly on the conceptual and application of the HAAAT model.

Chapter 2 introduces AT, discussing the history of technology that is designed specifically for persons with impairments and participation in technology. Everyone knows about the "impact" of consumer technologies. When our parents were young, when computers did not exist, and phones were not all that smart, and the Internet and television were not dominating their global experience. Today, things are different. Now they have dramatically impacted the technology options for people with various disabilities. These are both positive and negative consequences for people with disabilities. Part of the intention is paid to the international impact that these developments might have for people with disabilities in underserved countries.

Chapter 3 discusses the activity, human, and context components of the HAAAT model, including how they influence and interact with each other. Here we apply them to social and occupational issues to the assessment and use of AT, understanding the ability to access, understand, implement AT to be a right for all individuals for whom the technology will support engagement in daily activities and participation in their communities. The social and cultural components of the current element of the HAAAT model were selected to reflect issues of sustainability that affect AT provision and use. AT provision has to make sense for the context in which it will be used. Technology that works well in an urban area may be quite useless in remote areas such as the outback of Australia, areas of South America or African nations, or the far north of Canada. We recognize being aware of AT service provision in underserved areas to the extent of Chapter 4 and in other relevant sections of this book, recognizing that it is essential to extend the nature of the model to a level of the complexity.

Preface

Writing is no trouble: you just jot down ideas as they occur to you. The jotting is simplicity itself—it is the occurring which is difficult.

Stephen Leacock

Technology use is pervasive in almost everything we do. Technology development occurs at a rapid pace, making it difficult to keep current with the latest devices and software. The field of assistive technology (AT), commonly considered to be technology designed for individuals with some form of impairment, is expanding at a similarly rapid pace. The revisions in this latest edition of *Assistive Technologies: Principles and Practice* reflect the constant and rapid pace of change as well as the changing perspective of what constitutes AT. The book is written to support students in rehabilitation, engineering, and other relevant programs and service providers in the acquisition and application of knowledge that supports the provision of AT services.

Both of us are from North America and primarily understand AT issues from that perspective. However, in the years since the first edition of this textbook was published, we know that it has been used outside of this context and has been translated into multiple languages. Similarly, events such as the signing and ratification of the United Nations Convention on the Rights of Persons with Disabilities by many nations and the publication of the World Health Organization's *Report on Disability* position AT provision and use as global concerns. Consequently, we have attempted to provide a more global perspective to this edition through descriptions of processes that can be applied in different contexts and discussions of issues of appropriate and sustainable AT service delivery. The rapid development of AT applications for mainstream technologies has also made AT more accessible in underresourced countries. These topics are evident throughout the first few chapters discussing the Human Activity Assistive Technology (HAAT) components, ethical issues in AT and AT service delivery, as well as in the discussion of different categories of AT.

Assistive technology service delivery is founded on five principles that are clearly articulated in this book. Earlier editions contained three basic principles describing a person-centered approach, focused on functional outcomes supported by evidence, to which we have added two more reflecting ethical and sustainable service delivery practices. We have attempted to make the application of these principles more explicit throughout this edition in the description of the elements of the HAAT model and the service delivery process and in the discussion of categories of AT. Chapter 1 presents foundational ideas for the subsequent chapters in

this edition. In addition to the principles and the HAAT model, definitions of AT, complementary models of health and functioning, legislative aspects, and a summary of some of the research applying the HAAT model are covered in this introductory chapter.

The HAAT model guides assessment and evaluation of AT use by clients. It provides a framework for assessing the usability of technology and guides product research and development. The basic structure of the HAAT model remains unchanged from earlier editions. However, in this edition, we have provided considerably more depth to the discussion of each of the individual elements. Furthermore, we discuss how the elements interact with and influence each other to support a human doing an activity in context using AT. Chapters 2 to 4 expand significantly on the concepts and application of the HAAT model.

Chapter 2 introduces AT, discussing the blurring of technology that is designed specifically for persons with impairments and mainstream technology. Everyone knows about the “explosion” of mainstream technologies. When our previous edition was written, tablet computers did not exist, cell phones were not all that smart, and the Internet and connectivity were just beginning their global expansion. Today these things are old news, but they have dramatically impacted the technology options for people with various disabilities. There are both positive and negative consequences for people with disabilities. Particular attention is paid to the international impact that these developments might have for people with disabilities in underresourced countries.

Chapter 3 discusses the activity, human, and context components of the HAAT model, including how they influence and interact with each other. Here we apply ideas of social and occupational justice to the access to and use of AT, understanding the ability to access affordable, appropriate AT to be a right for all individuals for whom the technology will support engagement in daily activities and participation in their communities. The social and cultural components of the context element of the HAAT model were enhanced to reflect issues of sustainability that affect AT provision and use. AT provision has to make sense for the context in which it will be used: technology that works well in an urban area may be quite useless in remote areas such as the outback of Australia, remote areas of South American or African countries, or the far north of Canada. We sought to bring issues of AT service provision in underresourced areas to the forefront in Chapter 3 and in other relevant sections of this book, recognizing that all we can do is scratch the surface of this topic in a book of this complexity.

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Principles of Assistive Technology: Introducing the Human Activity Assistive Technology Model

CHAPTER OUTLINE

Introduction

- Contextual Background of the Book*
- Constructs of Disability in Key Documents
- Definitions of Assistive Technology
 - Formal Definitions*
 - Informal Definitions*
 - Differentiating Assistive Technology from Other Technologies*
 - Summary*
- Principles of Assistive Technology Service Delivery
 - Person Centered, Not Assistive Technology Centered*
 - Focus Is on the Functional Outcome and Participation*
 - Evidence-Informed Process*
 - Ethical Process*
 - Assistive Technology Services are Provided in a Sustainable Manner*

The Human Activity Assistive Technology Model

- Foundational Concepts*
- Activity*
- Human*
- Context*
- Assistive Technology*
- Reassembling the Human Activity Assistive Technology Model*
- Ecological Models of Assistive Technology*
- Application of the Human Activity Assistive Technology Model
 - Product Research and Development*
 - Usability*
 - Clinical Assessment*
 - Outcome Evaluation*
- Summary

LEARNING OBJECTIVES

On completing this chapter, you will be able to do the following:

1. Define assistive technology (AT).
2. Describe key principles of AT service delivery.
3. Describe contributions of existing ecological models of health to the conceptualization of the Human Activity Assistive Technology (HAAT) model.
4. Describe the purpose of the HAAT model.
5. Describe the activity, human, context, and AT components of the HAAT model.
6. Describe four applications of the HAAT model for AT research and clinical applications.

KEY TERMS

Activity
Activity Output
Assessment
Assistive Technology
Assistive Technology Service
Beneficence
Context
Enabler

Ecological Models
Environmental Interface
Evidence Informed
Ethics
High Technology
Human
Human Rights
Human Technology Interface

Low Technology
Mainstream Technology
Nonmaleficence
Outcome Evaluation
Processor
Social Justice
Usability

INTRODUCTION

Contextual Background of the Book

Disability is seen as a socially constructed phenomenon that results from barriers that are present in the environment. This view of disability locates it within the environment rather than within the person. The World Health Organization's

(WHO's) International Classification of Functioning, Disability and Impairment (ICF) views disability as the result of an interaction between the person and his environment. Viewed this way, disability is possible in everyone's experience (Bickenbach et al., 1999).

The worldwide prevalence of disability is difficult to estimate because of challenges of definition of cohesive

definitions of disability and technical aspects of data collection. However, the WHO *Report on Disability* (2011) estimates that approximately 720 million people worldwide experience some form of disability (WHO, 2011, p. 27). Furthermore, approximately 190 million (or 3.8% of the world's population) experience "severe disability" that limits their ability to participate in daily activities.

People with disabilities are much more likely to live in countries that are considered to be of low or middle income. Estimates suggest that 89% of people with vision impairment, 76% with hearing impairment, and 92% of those with a disability resulting from an intentional or unintentional injury live in a low- or middle-income country (Samant, Matter, & Harris, 2012, p. 1). Similarly, women, older adults, and people living in poverty have a greater prevalence of disability (WHO, 2011).

Disability has significant consequences on an individual's life. Persons with a disability have a greater likelihood of being under- or unemployed; they and their families are more likely to have a lower socioeconomic status; they experience poorer health; they are less likely to receive an education; and they experience more social isolation, less community participation, and less safety and security (they are more likely to experience physical, mental, or financial abuse).

Assistive technology (AT) is one of many opportunities that are necessary to reduce the disabling influence of many environments. Technology is a ubiquitous part of our everyday lives, which for the most part, makes our daily tasks simpler to do. This book focuses on the different aspects of using technology to meet the needs of individuals with a variety of disabilities. We will present a model that guides service delivery, **outcome evaluation**, and research and development of AT.

CONSTRUCTS OF DISABILITY IN KEY DOCUMENTS

The United Nations (UN) Convention on the Rights of Persons with Disabilities (CRPD) opens with a statement that recognizes the "inherent dignity and worth and the equal and inalienable **rights** of all members of the human family as the foundation of freedom, justice, and peace in the world" (UN, 2007, p. 1). It recognizes that disability occurs at the intersection of the person and the **context** in which they live and consequently, that the extent of disability is different for individuals living in different contexts. This document describes rights of persons with disabilities, with the explicit expectation that member states who are signatories to the document will enact legislation, regulations, and other measures to ensure these rights for their citizens.

The CRPD enshrines the rights of persons with disabilities to be treated as equals before the law and to be "entitled without any discrimination to the equal protection and equal benefit of the law." Persons with disabilities have the right to be recognized as "persons before the law" (UN CRPD, p. 8). In other words, the presence of a

disability does not nullify the state's recognition that the individual is entitled to the full benefits and responsibilities of citizenship. This convention prevents a member state from declaring a person with a disability to be a nonperson, which means he or she is not entitled to vote, own property, participate in civic governance, or enter into a legal contract. If you recall the limitations on the rights of women before the suffragette movements of the early 1900s, you will better understand the intent of this particular article of the CRPD.

Women and children with disabilities are given particular attention given their vulnerability to discrimination and abuse because of gender or age.

Beyond rights and protections afforded to all global citizens, the CRPD identifies several that are specific to persons with disabilities (Table 1-1) and describes the articles that are relevant to AT use, service delivery, and research and development.

Assistive technology is mentioned specifically in many of the sections of this convention, calling for research and development of all types of AT, requiring many other forms of technology (information and communication technology in particular) to be accessible in terms of use, availability, and information; promotion of AT accessibility; and provision of information about AT in accessible formats. It further calls for education of professionals to support all aspects of AT service delivery (UN, 2007).

DEFINITIONS OF ASSISTIVE TECHNOLOGY

Formal Definitions

Definitions allow us to frame the construct of interest and convey to others what we include and exclude in the use of a term. In a legislative or policy context, definitions delimit the scope of the law or policy, influencing how each is interpreted and applied. For example, in jurisdictions where AT funding is supported through government, a definition is used to determine what constitutes an assistive device that is eligible for funding versus one that is not. Definitions outside of this context can also help to conceptualize the term and understand the perspective of the individual or collective that conceived the definition.

Two formal definitions of AT, which are commonly used, come from the United States legislation The Assistive Technology Act of 1998, as amended (2004) and from the WHO. The US legislation defines AT 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 individuals with disabilities."

Similarly, the WHO (2001) defines AT as "any product, instrument, equipment, or technology adapted or specially designed for improving functioning of a disabled person." These two definitions both focus exclusively on the technology and limit it to a tangible object that is usable by a person with a disability. The US definition is more inclusive of mainstream technologies than the WHO version.

4th
EDITION

Assistive Technologies

Principles & Practices

Understand the current strategies and information you need to make confident clinical decisions about assistive technology devices, services, and practices.

Based on the Human Activity Assistive Technology (HAAT) model developed by the authors, **Assistive Technologies: Principles and Practice, 4th Edition** provides detailed coverage of the broad range of devices, services, and practices that comprise assistive technology. The authors focus on the relationship between the human user and the assisted activity within practical contexts to help you better apply the concepts you have learned to real-life practice and assist your clients more effectively.

- **NEW! Global issues content** broadens the focus of application beyond North America to include technology applications and service delivery in developing countries.
- **NEW! Coverage of ethical issues and occupational justice** exposes you to vital information as you begin interacting with clients.
- **NEW! More case studies** added throughout the text foster an understanding of how clients use assistive technologies and how they function.
- **NEW! Updated content** provides current information on devices and technology that can enhance the human cognitive processes.
- **NEW! Explicit applications of the HAAT model** in each of the chapters on specific technologies and more emphasis on the interactions among the elements make content even easier to understand.
- **Focus on clinical application** guides you in applying concepts to real-world situations.
- **Review questions and summaries** in each chapter help you assess your understanding and identify areas where more study is needed.
- **Content on the impact of AT on children** and the role of AT in play and education for children with disabilities demonstrates how AT can be used for early intervention and to enhance development.
- **Coverage of changing AT needs** throughout the lifespan emphasizes how AT fits into people's lives and contributes to their full participation in society.

Recommended
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