Preface

I am a fan of technology and science fiction. Ever since I started my studies in Information Technology and even before that, I remember myself in numerous situations facing problems in everyday life and thinking: “How could I make this easier with use of technology?” Twenty years ago, I would go home and start coding a small program in my PC to make things easier. Then, about 10 years ago, my PhD research opened a whole new prospect to that question. I had the opportunity to work on a subject related with Web accessibility, and from the first moment I met the people in the school for blind children in Thessaloniki, I was fascinated. I found a whole new area of applications of new technologies, technologies that were not even known or thought by the rest of us, hidden in places like that and limited for people with disabilities. The same question was even stronger this time: “How can technology make things easier for people with disabilities?”

My research experience throughout my PhD brought me into contact with many people working on the eAccessibility and Assistive Technologies domain. I had the opportunity to meet brilliant people in conferences and talks, and I started reading a lot about the whole area of accessibility. The area of eAccessibility and Assistive Technologies was feeding my passion for technology. Sometimes reading about new developments in the area, I was feeling like we were starting to touch aspects of the science fiction books of William Gibson that I was reading back in the beginning of my involvement with technology. However, there always seemed to be a line between my research and discoveries in eAccessibility and the rest of the world. Technologies in many cases were expensive and difficult to find and access because of their narrow targeting to people with disabilities. The market seemed to be quite limited, and my perception of technologies started to change.

It was at that time that I started noticing two basic patterns or trends:

1. Situations where I would like to have an assistive technology to make my life easier, and
2. Situations where mainstream technologies that we are using could probably be used by persons with disabilities to solve some of their (many) problems.

For example, the need to read my SMS or emails while driving my car or having a videoconference and realizing that such tools have probably made phone calls a reality for deaf people. The mobile revolution with smartphones has made such situations happen even more often. This made me realize that it was not a question about disabilities – it was all about needs! Needs that we all have under specific circumstances. Needs that were now even more common with everyday needs of persons with disabilities. We are all of us potentially disabled depending on the particular situation or the circumstances we are facing!

On the other side, new technologies are not always aiming towards the direction of facilitating accessibility. Many of them might build even more barriers to accessibility. Therefore, there was now a
battle in myself: my passion for technology and new developments of any kind in the area on the one side, and on the other side, my involvement and new passion for accessibility. This battle led me to look into new technology developments through the prism of accessibility. How could some technology be repurposed to help people with disabilities? What problems could it pose? How can we face them in the first place? These are now the questions I ask myself every time I read about a new technology, and all these questions and thoughts led me to write this book.

Therefore, this book is not intended to be an exhaustive guide to Assistive Technologies and eAccessibility technologies. It does not really aim to help people in the accessibility domain. It aims to connect accessibility with the rest of the world. What I would like to achieve with this book is to make people active in research in all technology domains see through the prism of accessibility that I am now looking at things. To offer these accessibility “glasses” to the reader. To change our perception of accessibility, Assistive Technologies, and eAccessibility, and bring it a step closer to rest of us. Therefore, by the end of this book, I hope that you will be able to see the world through a different perspective and try to make it a more accessible world for all!

OVERVIEW

The main goal of this book is to identify the range of technologies that will contribute to improving the lives of people with disabilities, enabling them to live fuller, more independent lives. Nowadays, the concept of disability includes a wide range of physical, cognitive, and behavioural conditions. In a few years, society and research communities will have completely internalized the idea that most people can benefit from the use of technologies originally intended for people with disabilities or to improve human performance. This will expand the market for e-access, e-assistive, e-inclusive, and enhancing performance technologies, boosting the economic viability of invention in this domain, and encouraging innovation and investment.

This book describes a wide range of relevant technologies available and emerging today, their maturity, possible future development, and the ways in which they may be of benefit to those interested or involved in the way technology affects people with disabilities, the elderly, or anyone trying to improve their performance in professional or other aspects of happy, healthy, and productive living.

The main guiding principles have been as follows, all of which are explained in more detail at various points in the chapters of this book:

- An economic model of disability that completes the well-established medical and social models and changes the basic driver from a rights and compliance issue to a market-demand driver; hence, the consumer-oriented model is, as expected, an integral part of a wider-scope economic model.
- A broad concept of disability that goes beyond permanent disabilities to include progressive and situational disabilities arising through work, injury, specific circumstances or old age.
- A focus on abilities rather than disabilities, in the interest of social justice, as well as with a view to expanding the market for assistive technologies by making it relevant to the greatest possible population of users.
- Recognition of the need to connect research with innovation, demonstration, and deployment to ensure the highest possible impact of investment in research in this domain.
- Awareness of the fact that there is a great degree of innovation in the way that research is carried out and these new methods may be very important for the future. Particularly strong trends include
the use of prizes and competitions, as well as the role of design, the need for research on business models, and the need to integrate end-users and lead-users into networks for open-innovation.

Apart from the above principles, the book is also based on a series of general observations:

- Specific different disabilities might affect the ability of someone to use the rapidly developing mainstream technologies that have become an essential part of all our lives. These include mobile telephony, the Internet, TV, ATMs, vending machines, etc.
- Some technologies originally developed for use by people with disabilities have proven very useful for mainstream users as well. Especially after the evolution of the mobile market that made needs of people with disabilities a common place for all under specific circumstances.
- Looking at the broad spectrum of disabilities, we can see a number of technologies are applied in each case that might have application in the future.
- Finally, new and emerging technologies that seemed to hold promise for the future were investigated. In particular, the book is focusing on new and emerging technologies that seem to be going through some kind of a transition due to a change in the dynamic or pace of change, a significant breakthrough, or a rapid growth in interest.

Thus, this book intends to help the reader understand how these technologies would serve as access technologies, as assistive technologies, or as a means to support inclusion of people with disabilities in all of the major activities of living including activities that require mobility and transport, shopping, the consumption of media or entertainment, the experience of citizenship, and work.

To help the reader in his reading experience, the book is divided into three main sections.

FIRST SECTION: TECHNOLOGICAL GAME-CHANGERS

The first section deals with new and emerging technologies that are potential game-changers, in the sense that they could one day surpass or replace many of the classical approaches to solving the problems of e-access, e-inclusion, and e-assistance. This section titled “Technological Game-Changers” deals with possible disruptions from advances in the following areas:

1. Sensors, Networks, and Cloud
2. Keyboards, Screens, and Mice
3. Robotic Exoskeletons and Social, Companion, and Service Robots
4. BCI (Brain Computer Interfaces), BNCI (Brain Neural Computer Interfaces), and BMI ((Brain Machine Interfaces)
5. Advanced Prosthetics, Neuroprosthetics, and Artificial Limbs

Each area is presented and discussed in a respective chapter. This section presents latest developments in these areas in order to give the reader an overview of what has been achieved lately, what is the pace of development in each area, and what are the problems and key challenges to be faced in the future. Therefore, this section of the book does not aim to provide an extensive and exhaustive guide to
all available existing Assistive and eAccessibility Technologies. It focuses on specific technologies that are considered game-changing technologies due to their potential impact for accessibility.

This section also helps the reader get the bigger picture on a number of technologies in order to read easier and understand better the next section that focuses more on the applications of these technologies in aspects of real life.

SECOND SECTION: ASSISTED AND INDEPENDENT LIVING APPLICATIONS

The second section presents a series of technological advances and potential future developments in various technologies having as a main axis the user’s point of view. It addresses basic user needs for every person in the following eight chapters:

6. Health and Human Services
7. Transport and Mobility
8. Training, Teaching, and Learning
9. Employment and Employability
10. Consumer and Lifestyle
11. Media and Entertainment
12. Democracy, Citizenship, and Activism

In each chapter user needs related to that area are analysed, accessibility issues for these needs are identified, and combined with the technological advances, they produce specific future cases describing instances of the future in a particular part of the general theme. Each chapter covers a variety of specific aspects related with the theme trying to cover it from all angles and throughout the life span of a person. This section aims to offer the reader with a number of key issues to be addressed and taken into account in the future research development of technologies while also there are suggestions for roadmaps or policies that could help achieving the future cases described.

THIRD SECTION: COMMON ISSUES

The third section contains three horizontal themes, which we believe are best discussed after exposure to the range and complexity of issues discussed above. These themes deal with human performance as a driver for developments and the organisation of research and innovation for greatest impact. They also deal with the need to address issues of a systemic nature. These three chapters are titled:

13. Human Performance
14. Systems and COMPLEXITY
15. Innovation

Christos Kouroupetroglou
Caretta-Net Technologies, Greece