

Essentials of Mobile Handset Design

Discover what is involved in designing the world's most popular and advanced consumer product to date – the phone in your pocket. With this essential guide you will learn how the dynamics of the market, and the pace of technology innovation, constantly create new opportunities which design teams utilize to develop new products that delight and surprise us. Explore core technology building blocks, such as chipsets and software components, and see how these components are built together through the design lifecycle to create unique handset designs.

Learn key design principles to reduce design time and cost, and best practice guidelines to maximize opportunities to create a successful product. A range of real-world case studies are included to illustrate key insights. Finally, emerging trends in the handset industry are identified, and the global impact those trends could have on future devices is discussed.

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I would like to thank my friend Cherie Blair for her support and encouragement in using mobile technology to empower humanity and my mother, Lovely Naha, who taught me the power of education. Special thanks to Sammy, Jy and Shaan for their love.

Abhi Naha

To my loving family – Janice, Ben, Cathy and Sam, and to my mother, Janet Whale, who taught me the power of goals.

Peter Whale

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“The mobile phone has transformed the world. Not only has it delighted consumers in the West, but it has been at the heart of a bottom up innovation revolution in Africa, Asia, and Latin America. Naha and Whale, in their various roles throughout their varied careers, have been a central part of this revolution and will continue to shape it in the future. This book draws on their rich experience. It is a remarkable resource for all (and there are many) who have an interest in mobile handset technology.”

Jaideep Prabhu, Cambridge Judge Business School

“Mobile handset design is incredibly important, affecting the lives of most of us, and the fate of major corporations. This year there will be more handsets than people on the planet. Handsets are one of the most ubiquitous artefacts made by man, yet their inner workings are magical and mysterious to many. Starting from a historical perspective our two wizards take the reader step by step through an overview of the internals and the design process before concluding with a chapter on future trends, which alone is worth buying the book to read. Essential for anyone in or interested in the mobile industry.”

Jack Lang, Serial Entrepreneur and Fellow of University of Cambridge

“As an interested amateur in the mobile world I found it fascinating to learn of the history and evolution of this simple but powerful tool which has transformed our world.”

Cherie Blair, Founder of Cherie Blair Foundation for Women

“Well done! It’s highly informative and incredibly detailed. Design of mobile devices requires a complex and seemingly endless series of deeply varied and dynamic considerations. Few people can appreciate the incredible team effort required to create a truly winning solution. This book shares the multitude of layered technologies that have been at the core of my evolving world as a mobile design leader.”

Frank Nuovo, Design Studio Nuovo, Former Chief of Design for Nokia and Vertu

“Mobile phones now have 500,000 times as many transistors as the first working device in the early 70’s. But as this book shows, it is possible to understand the whole process of designing one of these extraordinary machines. Taking an ‘holistic’ approach, Abhi Naha and Peter Whale touch on all aspects of mobile phone design, whether it be branding, software, electronics, functionality or project management, and they show that good design requires thinking about the issues from many different points of view.

“We are entering a new era of open hardware and software, where new gadgets will be brought into existence by groups whose members are distributed around the world. This book sets out not only how to design one of the 6 billion phones on the planet today but also points the way as to how many will be designed in the future. A must read for anyone interested in mobile handset design.”

David Cleavelly, Serial Entrepreneur and Chairman of Cambridge Wireless

“The book describes in a clear and concise way the extraordinary progress in handset design over the last two decades. If as a student or practising engineer you need to know how one of the most important components of the global digital infrastructure is engineered then I would recommend this book. Some of the most popular handsets are described and put in context. The crucial role of design is emphasised and future trends and development paths are enumerated. An excellent read about an indispensable piece of equipment for everyone”

Andy Hopper, Head of Department, The Computer Laboratory, University of Cambridge

“Tens of thousands of mobile handsets have been launched; yet mere dozens have become spectacular successes. Each triumphant handset has shared one key attribute – good design, inside and out. Good engineering matters little if its functionality is rendered inaccessible by flawed interface design. This book is a useful, comprehensive guide to the myriad factors that collectively create a winning design.”

Paul Lee, Director / Technology, Media & Telecommunications, Deloitte LLP

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Preface

On October 31, 2011, statisticians at the United Nations believe that the world reached a global population of seven billion people. Industry analysts estimate that, a few weeks later, the six billionth active cellular phone connection was achieved. Even considering that some people have multiple phone connections, it is still incredible that the majority of human beings on our planet own a mobile handset – across all geographies, cultures and societies. The ability to connect to people and information, wherever you are and whenever you want to, is bringing into reality the concept of the global village and a shared humanity. Yet at least as amazing is the fact that this ubiquitous product is also the world's most advanced consumer electronics product ever. It is small, light, portable and affordable to most people. It can perform ever more functions, with increasing performance. How is this possible and how has this come to be? What really is involved in designing and bringing to market both the inner technology and the final desirable mobile handsets? How can new products be developed so quickly, and why are there so many to choose between?

This book is aimed at anyone who is curious about such questions, yet has limited time to invest. You can read the book completely over a weekend if you need a lot of knowledge quickly, or you can dip in and out of the book to gain insight into particular areas as you need them. Blaise Pascal in his *Provincial Letters* wrote “I would have written a shorter letter, but I did not have the time.” We have found the truth in this, as condensing down the key insights from as complex an industry as the mobile handset industry into the convenient format of the *Wireless Essentials* series has been a significant undertaking – it would have been easier to write a larger volume. However, the format offers you the benefit of being able to gain a really good appreciation of the technology, design processes and market issues involved in mobile handset design relatively

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quickly. As you read the book, we trust that you will gain good insight into a set of common design and market issues which re-appear consistently as we look at different aspects of both the underlying component technology and the handset product design process.

We are both practitioners in the mobile industry. We have spent most of our working lives living and breathing the topics we cover, and much of what we write is from first-hand experience. Our approach is to introduce you to the fundamental design and engineering principles used in creating handsets and their component technologies, and to give you an “under the hood” understanding of a mobile handset. We have sought to do this in such a way so that whether you are a curious consumer, a technologist, designer, developer, lecturer, student or brand marketer, you will gain a good appreciation and enough understanding to hold useful discussions with other practitioners in the mobile industry – or enjoy using your mobile handset more because of a deeper appreciation of its inner workings and the process of creating it.

One of the takeaways of this book is that such is the complexity of the technology, the industry and the global market, that no one can claim to be truly an expert of it all. Rather, it is by many thousands of talented designers, engineers, marketers and others bringing their expertise together and working well together as teams, organizations, industries and ecosystems that the phenomenon which is the mobile handset is possible. To do this well requires an understanding and appreciation of the design challenges between different disciplines, and the ability to take a holistic view of the whole design process and value chain. Our aim therefore is not to make you an expert, but rather to raise your general level of knowledge and understanding of what is involved in the design of a mobile handset, as well as the level of communication and partnerships needed to achieve success. If you work in any aspect of the mobile industry, we hope that this book will help you to reach out beyond your domain expertise. Our aim is that, with the extra knowledge and insight gained from reading this book, you will benefit from dialog and partnership with experts from other domains, and that this will lead to you achieving your business goals more rapidly and successfully.

Regarding the use of the term “mobile handset,” we have had several discussions on using the term “handset” as opposed to any other term, such as mobile phone, cell phone or connected device, particularly as new classes of portable devices enter the market such as tablets, e-readers and the like. One piece of future-oriented research suggests that mobile handsets will take the form of tiny implants so perhaps we should be using the term “headset” rather than “handset.” For simplicity and consistency, we settled on using the term “mobile handset” throughout the book to refer to all types of cellular device, irrespective of form-factor, market or geography.

In writing a book about an industry which continues to develop at such a fast pace, one area of concern is about keeping any book about the mobile handset up to date. Our approach has been to describe the fundamental handset design principles and strategies that we believe have remained constant in the journey so far, and perhaps will remain so for many years to come. What undoubtedly will change is the creation of new technologies, applications, services and markets, as the fuel of the mobile handset industry is continued and rapid innovation. The principles we describe should help you to continue to evaluate the benefits of further innovation and the value they add to the design process in creating engaging and desirable mobile handset user experiences. Lastly, with the agreement of our publishers, we have created the website www.mobilehandsetdesign.com to capture some of the new trends, debates and discussions which will unfold in the future, and we will aim to keep this fresh and up to date. Finally, we hope you enjoy reading this book as much as we have enjoyed writing it.

Acknowledgements

Abhi would like to thank Frank Nuovo and Dr Peter Ashall for the very lively and passionate discussions on mobile handset design, and Ken Blakeslee for keeping Abhi grounded on the importance of end-user value.

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A special thank you from both of us to Sarah, Julie, Lucy, Elizabeth, Irene and the team at Cambridge University Press for their forbearance, patience and encouragement during this writing project (it took somewhat longer than we all expected), and to Professor William Webb for his valuable guidance and support in keeping us on track with our book.