



WILLIAM WEBB

Wireless Communications

THE FUTURE

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Wireless Communications: The Future

Professor William Webb



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Wireless Communications: The Future

To Katherine and Hannah, who will be choosing their own future over the next 20 years.

Preface

My previous book forecasting the future, *The Future of Wireless Communications*, was published in 2001, but mostly written during 2000. This was the time just before the 'dot.com bubble' burst. At that point Internet and wireless companies were flying high, and to predict anything other than a bright future would have seemed highly pessimistic. Of course, that all changed during the latter part of 2000 and 2001 as is well known, and explored later. Now, predicting a bright future for wireless communications is more likely to be seen as unduly optimistic. As will be explored throughout this book, these changes in the market have broadly not changed the technological roadmap that we predicted earlier, but they have had an impact on the timing of the critical investment. Overall the events have been so tumultuous for the industry that another version of the book, some six years after the first edition, seems appropriate.

Along with the wireless communications environment, my role has also changed somewhat. In September of 2001, a few months after the publication of *The Future of Wireless Communications*, I left Motorola and returned to the UK and to the consultancy environment. After a spell with PA Consulting Group, the UK's sixth largest consulting company, I moved to Ofcom, the UK regulator of all things to do with communications, as the Head of Research and Development. This has given me the ability to commission research across a wide range of communications technologies and to be involved in developing policies, such as the UK's 'Spectrum Framework Review' that will shape the industry and the future in their own right.

Other appointments have helped me in this respect. I play a range of roles within the Institute of Engineering and Technology (IET) where I am a member of the Board of Trustees and chair of the *Communications Engineer* Magazine Advisory Panel. My appointment as a Fellow of the Royal Academy of Engineering provides me with access to most of the key engineers in the UK and my role as a Visiting Professor at Surrey University gives me access to world-class research. Finally, my appointment to a number of judging panels such as the *Wall Street Journal's* Annual Innovations Awards has provided me with valuable information and contacts in understanding strategic changes in the industry.

In the preface of the earlier book, I noted that there seemed to be nobody producing a coherent and well thought-out vision as to how the whole world of wireless communications would develop, and perhaps converge, over the coming years; and that further, nobody

seemed to be prepared to try to predict 20 years out. This still appears to be broadly the case – there have been a few books published with individual essays on the future but no coherent and complete text. Hence, I believe it is worthwhile to publish a new version of this book, to continue to provide some sort of a framework on which future strategic decisions can be made.

Those readers who recall the earlier version will remember that around half of the book comprised contributions from a range of eminent industry experts. I have used the same format in this edition, but have elected to ask a different set of experts for their views. I have made this decision in order to provide increased diversity of views and not because of any implied criticism of the previous experts – indeed, as will be demonstrated throughout this book they did an outstanding job in predicting the future.

Perhaps it is worth explaining why I am qualified to undertake such a task. I am an engineer, qualified to PhD level, but also with business qualifications. I have spent much of my career as a consultant, working across a wide range of different problems and issues with clients including regulators, governments, user groups, operators, manufacturers and SMEs. I have also spent time working for Motorola and for the UK regulator, Ofcom. Projects have varied from building hardware demonstrators of novel technologies through to developing business cases for operators planning national roll-outs. I have lived in the UK and the USA and worked for clients around the world including diverse environments such as South Africa, Bolivia, Denmark and Ireland. And above all else, I have previously made a range of predictions, almost all of which have proven to be accurate.

As always, it is important to remember that ‘forecasting is very difficult, especially when it concerns the future’. The forecast presented in this book is highly unlikely to be correct in every respect. Regardless of this, the information presented here and the thought processes followed will be of value in helping others to build their own view of the future and to modify that view as circumstances change.

Acknowledgements

Firstly, I am deeply indebted to those experts in the field of wireless communications who gave up their time to contribute substantial chapters and shorter pieces to this book. I would also like to express my thanks to the earlier contributors who made the previous version such a great book.

In writing this book I have drawn upon all my experience gained over my years in the industry. I have learnt something from almost everyone I have come into contact with and would thank all of those with whom I have had discussions. Special thanks are due to a number of key individuals. During my time at Multiple Access Communications, Professor Ray Steele, Professor Lajos Hanzo, Dr Ian Wassell and Dr John Williams amongst others have taught me much about the workings of mobile radio systems. At Smith System Engineering (now Detica), Richard Shenton, Dr Glyn Carter and Mike Shannon have provided valuable knowledge as have contacts with a number of others in the industry including Michel Mouly, Mike Watkins, Jim Norton and Phillipa Marks (Indepen). At Motorola I had tremendous guidance from a range of individuals including Sandra Cook, Raghu Rau, John Thode and the immense privilege of discussions with Bob Galvin, ex CEO. At PA Consulting, Dr Phil White, Dr John Buckley, Dr Mark Paxman and many others have contributed to my understanding of the cellular industry. In my work with Institutions I have been privileged to work with John Forrest CBE, Sir David Brown, Walter Tuttlebee, Peter Grant and many more. At Ofcom, Peter Ingram, Mike Goddard, those in my R&D team and others have provided invaluable guidance. Many presentations and papers from those involved in the mobile radio industry have contributed to my understanding.

Finally, as always, thanks to Alison, my wife, who supports all my endeavours to write books with good humour and understanding.

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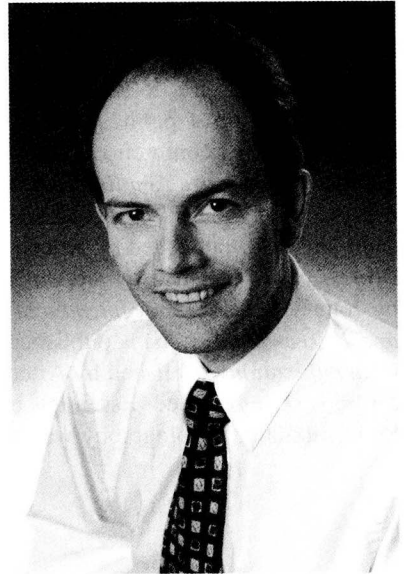
Note that the views and opinions presented in this book are those of the authors and not necessarily of the organisations that employ them. These views should in no way be assumed to imply any particular strategic direction or product development within the organisations thus represented.

About the Author

William has worked in the wireless communications industry since his graduation in 1989. He initially joined Multiple Access Communications, a consultancy based in Southampton, UK, in 1989, becoming a director in 1992. There he worked on many research and development projects including detailed research into QAM for mobile radio – the subject of his PhD thesis – directing multiple propagation measurements, designing and writing a microcell propagation tool and producing hardware demonstrators for early DECT and QAM systems.

He moved to Smith System Engineering (now Detica), based in Guildford, in 1993. There he undertook a wide range of projects including taking the lead technology role on the 'Smith/NERA' studies into the economic value of spectrum and spectrum pricing. He played a key part in the standardisation of the European Railway's GSM technology, authoring many of the changes to the standard within ETSI and working across industry to build support for the proposals. He also worked on PMR systems, providing strategic and technical advice to major users such as police and fire services. While at Smith he completed his MBA, continued to publish widely and became well known as a speaker and chairman on the conference circuit.

In an effort to widen his understanding of the cellular industry, William then moved to Motorola. He spent a year in the UK working in the European infrastructure division, then he moved to Chicago in the United States where he was a Director of Corporate Strategy. He also worked closely with Motorola Labs on research directions. This exposure to strategic and technological issues enabled him to produce Motorola's medium- to long-term strategic plan. At this point he was elected a Fellow of the Institution of Engineering and Technology (IET; formerly the IEE) and had his biography included in *Who's Who in America*.



William then returned to consulting, moving to PA Consulting Group in Cambridge as a Managing Consulting in 2001. At PA he consulted widely across the wireless industry on a range of strategic, technical and regulatory issues. He was asked to become a judge for the *Wall Street Journal's* Annual Innovation Award and has been invited to sit on this judging panel annually since. Also in 2003 he was invited to become a Visiting Professor at the Centre for Communications Systems Research at Surrey University. In 2004 he was elected as a Vice President of the IET where he sits on the Board of Trustees, directing the IET's strategy during a time of significant change and merger activity.

William joined Ofcom as Head of Research and Development just prior to it officially becoming the national telecoms regulator. Key outputs from the team include the Annual Technology Review and a range of research reports. William also leads across a wide range of spectrum strategy. He wrote the Spectrum Framework Review – Ofcom's long-term framework for radio spectrum management – and led on Ultra Wideband strategy and property rights for spectrum ('spectrum usage rights'). He is a member of Ofcom's Senior Management Group.

In 2005, at the age of 38, William was invited to become a Fellow of the Royal Academy of Engineering. This highly prestigious body comprises the top 1300 engineers in the UK. Admittance is by invitation only and limited to 50 engineers, across all disciplines, annually. Only a handful of individuals have ever been elected below the age of 40.

William continues to maintain a high profile in the industry. He has published over 70 papers in a mix of publications spanning learned journals to the *Wall Street Journal*. He chairs some six conferences a year, and speaks at another six or so. His books include: *Modern Quadrature Amplitude Modulation* published by John Wiley and the IEEE in 1994; *Introduction to Wireless Local Loop* published by Artech House in 1998; *Understanding Cellular Radio* published by Artech House in 1998; *The Complete Wireless Communications Professional* published by Artech House in 1999; *Single and Multi-carrier QAM* published by John Wiley in 2000; *Introduction to Wireless Local Loop – second edition: Broadband and Narrowband Systems* published by Artech House in 2000; and *The Future of Wireless Communications* published by Artech House in 2001. He has recently become a series editor for book series entitled 'Essentials in Wireless Communications' with Cambridge University Press. In 2006, his biography was included in Debrett's *People of Today*.

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