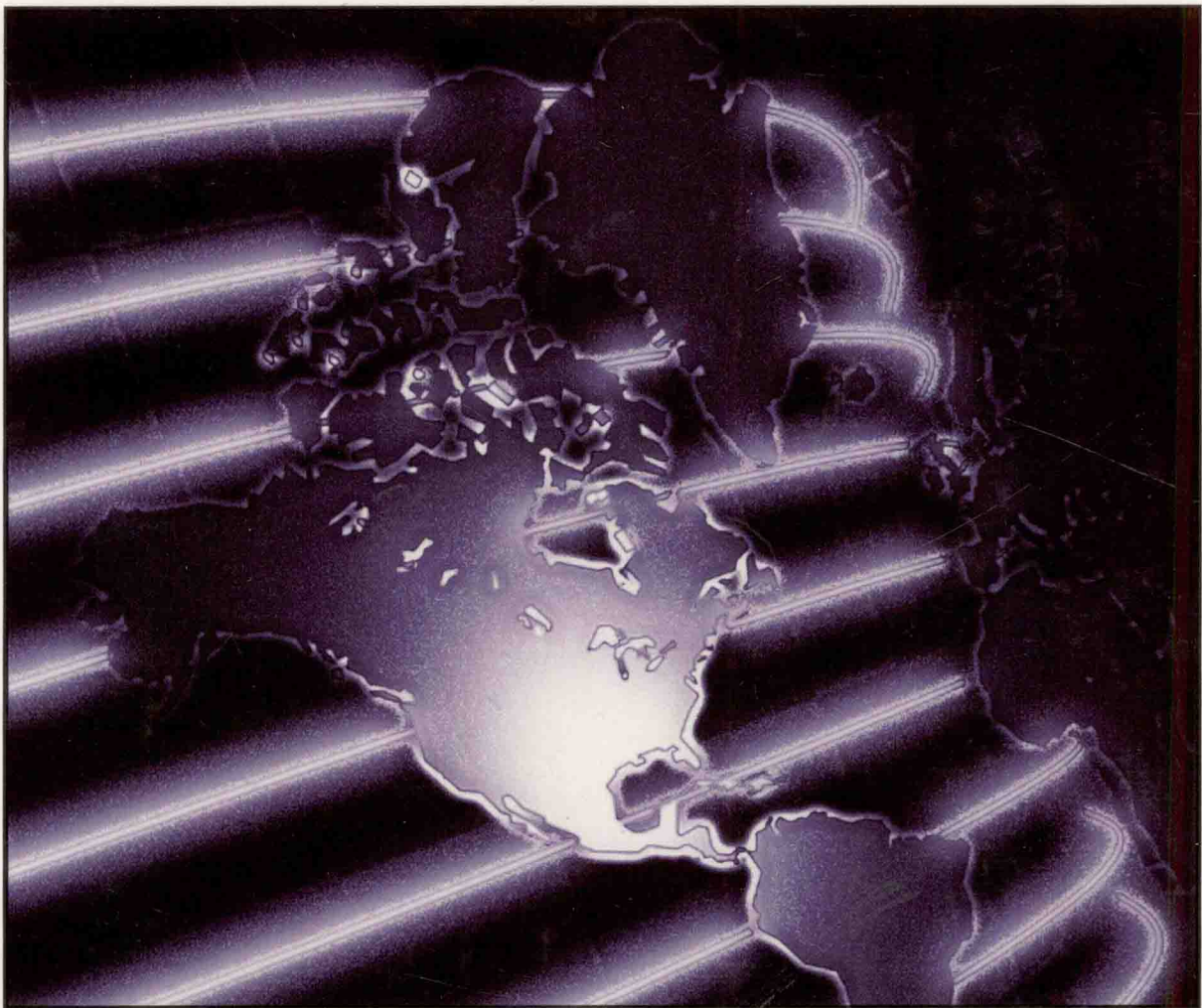# Global Diffusion of Broadband Data Transmission

Yogesh K. Dwivedi, Anastasia Papazafeiropoulou, & Jyoti Choudrie
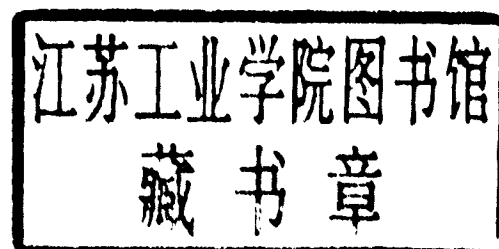**Volume I**

Handbook of Research on Global Diffusion of Broadband Data Transmission

Yogesh K. Dwivedi
Swansea University, UK

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Volume I

To my Mother and Father for their love and blessings…And to my lovingly and much awaited 'Shagun'

To Athina

To my dearest, wonderful, encouraging and supportive Mum, Dad and Bobby

Editorial Advisory Board

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Foreword

I have been interested in the development and evolution of broadband for many years, and the one thing that has struck me in that time is the dynamic nature of the subject. Just when we think that we have it captured and perhaps have established a mental model for understanding it, at least in our own domain, broadband confounds us by reinventing itself and bringing up new issues and challenges in our own area and around the world.

This handbook is testimony to the diverse nature of the subject, covering a wide range of issues and experiences in many sectors, industries, governments, regulatory frameworks, and areas of the world.

The book is truly international and provides examples and experiences that will surprise and engage even the most knowledgeable. For example, its chapters range from the affects of broadband on the motion picture industry in the United States, and thus the world, through to actual and potential healthcare benefits in the developing world—from capitalist economics to social and community benefits, and back. As well as the experiences in a global context, the book also covers the critical role of governments and regulation and the economic development aspects of broadband.

There can be few technologies that have been more influential and that have more serious and potentially beneficial social implications than broadband, and it seems we are only at the beginning of these affects. This handbook provides an essential guide to that diversity and the issues to be addressed for successful broadband implementation.

Professor Guy Fitzgerald
Brunel University, UK

Guy Fitzgerald is professor of information systems at Brunel University and is head of the Department of Information Systems and Computing. Prior to this he was the cable and wireless professor of business information systems at Birkbeck College, University of London, and before that he was at Templeton College, Oxford University. As well as being an academic, he has also worked in the computer industry with companies such as British Telecom, Mitsubishi, and CACI Inc., International. His research concerns the effective management and development of information systems and he has published widely in these areas. He is probably best known for his work in relation to development techniques and methodologies and is the author of a major text in this area entitled Information Systems Development: Methodologies, Techniques and Tools, now in its fourth edition. He is also well known for his research in the areas of strategy, outsourcing, and executive information systems. His most recent research is concerned with the development of flexible information systems to enhance organizational agility. He is founder and co-editor of the Information Systems Journal (ISJ), an international journal from Blackwell Publishing, and he has been a member of many international Program Committees, including the International Conference on Information Systems (ICIS) and the European Conference on Information Systems (ECIS).

Foreword

The vital role played in modern society by information and communication technologies (ICTs) is nowadays recognized by both businesses and governments alike. The UN openly acknowledges the importance of the digital environment as a tool for economic and business development,[1] and in Europe numerous EU initiatives[2] actively promote and monitor the adoption of ICT-supported practices in order to raise productivity and growth.

The changes brought about by the corresponding increasingly networked society have been many, with the last dozen years or so witnessing countless profound changes at societal, industry-sector, organizational, and individual levels. In this day and age, many of us now routinely make use of ICT for both work and leisure purposes, with speed and convenience of information exchange encouraging us to conduct transactions and communicate electronically with employers, work colleagues, friends, family members, businesses, and government agencies.

As a result of the emergence and regular use of a wide variety of ICT-supported ways of doing things, we have witnessed terms such as e-business, e-government, e-health, e-learning, message boards, chat rooms, and blogging become part of our recognized vocabulary. However, the continued adoption and widespread use of ICT in daily life depends heavily upon the availability of reliable high-speed networks, and there is no doubt that broadband is a key enabling technology that allows such activity to occur reliably and at acceptable speeds.

This obvious significance of broadband has been recognized by governments around the word, and despite the massive investments required in terms of the provision of new network infrastructures, many have introduced policies to promote broadband availability and uptake. Indeed, the availability of affordable broadband was a key objective of the e-Europe action plan, and the current strategic framework for the European Information Society (i2010) places particular emphasis on broadband coverage and reducing the digital divide. The social and economic importance of broadband availability[3] is such that broadband diffusion is often viewed as a means by which international competitiveness and economic development may be benchmarked.

It is within this context of widespread recognition of the significance of broadband and its corresponding promotion and take-up that this publication has been produced, and I am delighted to have been provided with the opportunity to write the Foreword to the *Handbook of Research on Global Diffusion of Broadband Data Transmission*.

The handbook is clearly a valuable resource, providing a timely and relevant collection of chapters addressing a variety of issues pertaining to the adoption and use of broadband and the reduction of the digital divide at both macro and micro levels. It is divided into five sections, each comprising a number of chapters and each addressing a different theme of broadband adoption. The international nature of the issue and its treatment within the handbook is clearly illustrated in the first section, which examines national policies affecting broadband deployment and diffusion in a range of countries including Aus-

tralia, Bangladesh, Germany, Greece, India, Ireland, Italy, Japan, New Zealand, Norway, South Africa, South Korea, Taiwan, and the United States of America. The second section focuses upon demand-side (i.e., consumer-related) factors influencing broadband adoption and use in countries such as Australia, Brazil, Chile, France, the Kingdom of Saudi Arabia, The Netherlands, the United Kingdom, and the United States of America. The third section is dedicated to examining issues of broadband use in small and medium-sized enterprises (SMEs) in Italy, Singapore, and the United Kingdom, while the fourth and fifth sections are devoted to examining the impact of broadband on emerging ICT applications and business models (including those in the entertainment and health industries) and macro and micro supply and demand factors in Australia, Canada, China, Denmark, Germany, Greece, India, Latin America, Sweden, and the United States of America respectively.

I am pleased to be able to recommend the handbook. It will prove highly useful to readers who are looking for substantive material on broadband promotion and adoption, and I should particularly draw attention to the variety of international perspectives presented. Overall the handbook provides an appealing treatment of the area, and I am sure it will be viewed as a valuable information resource on what is a highly topical and relevant subject.

Professor Michael D. Williams
Swansea University, UK
September 2007

ENDNOTES

[1]   General Assembly Resolution 56/183 endorsed the need to develop the so-called *information society.*

[2]   See for instance, the eEurope 2005 Action Plan, e-Business W@tch, and the e-Business Support Network.

[3]   *Broadband Access: The New Highways to Prosperity*—speech delivered by Vivian Reding, the member of the European Commission responsible for information society and media, at the "Bridging the Broadband Gap Through EU Spectrum Policy" event, Brussels, March 2006.

Michael Williams is a professor in the School of Business and Economics at Swansea University in the UK. He holds a BSc from the CNAA, an MEd from the University of Cambridge, and a PhD from the University of Sheffield. He has implemented and evaluated information systems in domains including finance, telecommunications, manufacturing, and government, is the author of numerous refereed and invited papers, and has obtained external research funding from sources including the European Union, the Nuffield Foundation, and the Welsh Assembly Government. He currently serves as an invited member of the project expert group for a European Union funded project examining transformative use of ICT.

Preface

As the Internet has become a part of everyday life, broadband has been considered as the necessary evolutionary step as a technology that offers fast, always-on Internet connections with access to services, applications, and content with real lifestyle and productivity benefits. International organizations such as the International Telecommunication Union (ITU) and the Organization for Economic Cooperation and Development (OECD) forecast broadband to be a vital means of enhancing competitiveness in an economy and also of sustaining economic growth. Examples of delivering economic value include the potential of improving the productivity and competitiveness of small- and medium-size enterprises (SMEs) and larger companies, as broadband provides an efficient channel for supply chain management implementation and saving costs of office space by supporting effective home-working. Similar to commercial organizations, broadband also offers the potential to governments of creating electronic services and delivering them to citizens in a cost-effective and transparent manner. Electronic services in the public sector have the potential to reduce the cost of delivery and increase the quality of healthcare, thereby increasing the citizens' trust and confidence in public services.

Broadband can also improve citizens' lives in several ways. It can help equip children with ICTs skills for employment purposes and improve the way they obtain education. Similarly, since broadband facilitates working at home, it can help people to obtain a better work/life balance that is characterized by more empowerment, more productivity, and less stress. Broadband also offers direct benefits to elderly people, as it can be utilized to provide personalized care at home—hence, removing the need to live in hospitals or care homes.

Since broadband Internet has the potential to profoundly impact science, business, and society—and transform almost every aspect of everyday life—it is appropriate and timely to understand the deployment and adoption of broadband technologies. Numerous researchers around the world have realized the importance of studying this research area and have focused upon accumulating knowledge in this area. Broadband research has been prolific for a phenomenon that is quite young. However, an analysis of the current literature on broadband suggests that the available body of knowledge is fragmented with some studies looking at adoption or usage patterns and some at the impact of broadband to existing or new Internet applications. This handbook is an effort to collect and group existing research results in order to offer an overall picture and comprehensive understanding of exploratory issues related to the deployment, diffusion, adoption, usage, and impact of broadband technology from a global perspective.

To access the latest research and provide an outlet to researchers in the field of broadband, the editors decided to launch this handbook where researchers from all over the world would assist in providing the necessary coverage of possible research issues within the area. The primary objective of this project was to assemble as much research coverage as possible related to the deployment, diffusion, adoption, use, and impact on emerging applications from studies conducted in various geographical settings. Our mission through this handbook is to provide an understanding of the global diffusion of broadband, examining

factors affecting its deployment, diffusion adoption, usage, and impact on consumers and businesses from a global perspective. Additionally, the handbook helps to understand differences in the adoption of broadband in different countries and examine policy issues at national and international levels.

In order to provide the most balanced coverage of concepts and issues related to the selected topics of this handbook, researchers from around the world were asked to submit proposals describing their proposed coverage and the contribution of such coverage to the handbook. All proposals were carefully reviewed by the editors in light of their suitability, researchers' records of similar work in the area of the proposed topics, and the best proposal for topics with multiple proposals. The goal was to assemble the preeminent research in broadband from all over the world to contribute entries to the handbook. Upon the receipt of full entry submissions, each submission was forwarded to at least two expert external reviewers on a double-blind, peer review basis. Only submissions with strong and favorable reviews were chosen as entries for this handbook. In many cases, submissions were sent back for several revisions prior to final acceptance. As a result, this handbook includes 49 entries highlighting aspects of deployment, diffusion, adoption, and use of broadband in various geographical settings. All entries are written by knowledgeable, distinguished scholars from many prominent research institutions around the world.

The extended and comprehensive coverage of broadband research in this distinctive book will contribute towards theory, practice, and policy. The theoretical contribution of this collection of studies is that it synthesizes the appropriate literature in order to enhance knowledge of broadband deployment, diffusion, adoption, usage, and impact from the global perspective. This handbook contributes to various theories and models from information systems, management, marketing, economics, and other social sciences disciplines. Some of the theories that this handbook contributes includes diffusion of innovations, technology acceptance model, theory of planned behavior, decomposed theory of planned behavior, model of adoption of technology in households, socio-technical approach, studies on developing countries, policymaking for telecommunications, and consumer behavior. Considering the relatively slow and heterogeneous adoption of broadband today, it can be learned that the policymakers and providers of the innovation—in this case the telecommunications industry—hold a specific interest in the findings of this handbook. Policymakers in various countries, particularly in the developing world, are currently investigating how to increase the diffusion of broadband within their own countries, and so information on other countries' experiences can prove useful. Additionally, the telecommunications industry is interested in determining how to improve their current strategies. Therefore, for both policy and practice, this handbook will offer an understanding of the broadband diffusion strategies at both the macro and micro levels. This is particularly useful as there is little research published in the area of deployment, consumer adoption, usage, and impact of broadband. Understanding the usage and impact of broadband will be helpful for content developing organizations to integrate compelling content with new generation broadband, as well as to broadband service providers seeking to improve their services.

In order to cater to the information needs of a diverse spectrum of readers and at the same time effectively present this global but complex topic, this handbook is structured into five sections, with each section including a number of divisions and consequent chapters. A brief description of each section, division, and chapter is provided below.

Section I: National Policies examines macro and supply-side factors affecting broadband deployment and diffusion in various geographical regions which are grouped into five divisions (Africa, Asia, Australia and New Zealand, Europe, and North America). A number of important factors including national policy, market competition, ICT competency, and digital divide are discussed within this section.

Nine chapters are included in this section which are further organized into five divisions, as noted above, according to their geographical orientation as follows: **Division I. Africa** (Chapter II: South Africa: The Long Walk to Broadband Freedom); **Division II. Asia** (Chapter III: Bridging the Digital

Divide Through Broadband Deployment, Chapter IV: Broadband Policy, Market Competition, and User Adoption in Taiwan, Chapter V: ICT Competency of Bangladesh to Face Broadband Diffusion, Chapter VI: Socio-Cultural Interpretations to the Diffusion and Use of Broadband Services in a Korean Digital Society, Chapter VII: Structural Changes and Regulatory Challenges in Japanese Telecommunications Industry); **Division III. Australia and New Zealand** (Chapter VIII: Analysis of the Influence of Australia's Government Policy on Broadband Internet Access, Chapter IX: Broadband for the Mass Market, Chapter X: Competition, Regulation, and Broadband Diffusion: The Case of New Zealand); **Division IV. Europe** (Chapter XI: Digital Divide and Broadband Access: The Case of an Italian Region, Chapter XII: Improving Broadband Access in Rural Areas, Chapter XIII: Metropolitan Broadband Networks: Design and Implementation Aspects and Business Models, Chapter XIV: Small World: The Irish Broadband Experience, Chapter XV: Social, Political, and Ethical Responsibility in Broadband Adoption and Diffusion: A German Case Study); and **Division V. North America** (Chapter XVI: Competition in Broadband Provision and the Digital Divide, Chapter XVII: Governmental and Cultural Factors in Broadband Adoption, Chapter XVIII: Regulation and the Deployment of Broadband). A brief account of these chapters is provided below.

Chapter II, "South Africa: The Long Walk to Broadband Freedom" by Justin Henley Beneke, aims to explore the development of broadband services in South Africa, as well as touching on the challenges faced in bringing this phenomenon into the mainstream. Reasons for the lack of diffusion and adoption of such services point to high end user costs of the service, a very limited geographical footprint of both fixed-line and mobile broadband infrastructure, as well as a lack of computer literacy and an understanding of what broadband is able to offer. The author of the chapter concludes with possible solutions to these challenges.

Chapter III, "Bridging the Digital Divide through Broadband Deployment" by Challa Radhakumari, provides a summary relating to the functioning of two projects in the two Southern States of India, Andhra Pradesh and Kerala, to show how through broadband deployment in rural areas the digital divide can be bridged. By focusing on the implementation of the two projects, the chapter illustrates their contribution in practically using broadband technologies in overcoming the hurdles to bridging the digital divide, and highlights the critical success factors as identified during the functioning of the projects which helped the two states in achieving their goals. The chapter concludes by providing recommendations for application of similar projects in other geographical settings.

Chapter IV, "Broadband Policy, Market Competition, and User Adoption in Taiwan" by Yu-li Liu, analyzes broadband adoption, competition among providers of broadband, and relevant policies in Taiwan. The research methods adopted include a literature review, in-depth interviews, and secondary analysis of previous surveys conducted by TWNIC. Since Taiwan's broadband penetration is the fifth highest in the world, the discussions of the major factors contributing to broadband deployment in this chapter can provide some useful experiences from which other countries may learn.

Chapter V, "ICT Competency of Bangladesh to Face Broadband Diffusion" by Anwarul Islam and K.C. Panda, examines the initiatives taken by Bangladesh to develop its sustainable information infrastructure, reporting that teledensity and overall IT infrastructure is now in the growing stage. Nevertheless, the broadband diffusion in Bangladesh is not on par with other Asian countries, as it is still in an embryonic stage in terms of broadband diffusion. This chapter, therefore, tries to show the initiatives taken and the existing condition of Bangladesh to achieve countrywide broadband diffusion.

Chapter VI, "Socio-Cultural Interpretations to the Diffusion and Use of Broadband Services in a Korean Digital Society" by Dal Yong Jin, attempts to ascertain the causes of the rapid growth of broadband services in the context of the broader socio-cultural elements. It recognizes technology as a socio-cultural product which has historically been constituted by certain forms of knowledge and social

practice, so this chapter explores cultural elements contributing to the diffusion of broadband services in the context of the cultural environment in Korea. Further, it discusses the significant role of the people, as users, in the process of the rapid diffusion and growth of broadband services.

Chapter VII, "Structural Changes and Regulatory Challenges in the Japanese Telecommunications Industry" by Hidenori Fuke, examines the structure of the telecommunications industry in Japan which has been undergoing immense change. The changes are observed in five phases: development of competition into the local call market, diffusion of broadband Internet and development of inter-platform competition, rapid growth of cellular services and Internet access via cellular, decline of POTS (Plain Old Telephone Service), and structural changes from vertical integration to layered structure and development of media convergence. These changes require total review of the regulatory framework that was formed in the POTS era. This chapter proposes a review of essential facilities regulation, a universal service system, and a flat-rate pricing system of the Internet in order to solve problems that are likely to distort the new industry structure.

Chapter VIII, "Analysis of the Influence of Australia's Government Policy on Broadband Internet Access" by Qiuyan Fan, provides an in-depth analysis of the impact of policy issues on broadband Internet access in Australia. The primary goal of this chapter is to develop a holistic understanding of Australia's national approaches pertaining to broadband Internet access. The government has been basing its actions on market forces which help in improving broadband Internet access in the major cities, but which, however, have little effect in regional and rural Australia. The research has indicated that the regulatory competition regime has failed to address concerns of market dominance and market power in the telecommunications sector as is evidenced by a relatively lower price-performance ratio of broadband services in Australia.

Chapter IX, "Broadband for the Mass Market" by Roger Saunders, suggests there is no new application to stimulate adoption of broadband by the mass market. Many new applications have been introduced but have not created the desired growth. One application that is identified as potentially having mass market attraction is Voice over Internet Protocol (VoIP), and it is the most likely killer application. However, failure by major communications carriers to develop VoIP is slowing broadband penetration to this larger market segment. Finally, the multitude of broadband packages offered by the various competing carriers creates confusion in the mass market which, as a result, defers purchase decisions.

Chapter X, "Competition, Regulation, and Broadband Diffusion: The Case of New Zealand" by Bronwyn Howell, offers a thought-provoking case study of the effects of different competition and regulatory policies on broadband diffusion rates. Despite New Zealand having one of the highest rates of Internet connection and usage in the OECD, widely available broadband infrastructure, and low broadband prices, broadband uptake per capita languishes in the bottom third of the OECD. The New Zealand case illustrates the effect that legacy regulations can have on both the diffusion of new technologies per se, and the choices made by consumers between different generational variants within that technology.

Chapter XI, "Digital Divide and Broadband Access: The Case of an Italian Region" by Enrico Ferro, J. Ramon Gil-Garcia, and Natalie Helbig, looks at the issue of digital divide, and based on a review of the literature on digital divide and broadband access, the authors document different approaches to understanding the phenomenon and argue that these perspectives can also help to understand broadband access. This chapter presents a case study conducted in an Italian region. The authors provide some implications of the findings and argue that policymakers should explore the relationship between IT skills acquisition, broadband access, and Internet use in order to develop more effective policies and programs.

Chapter XII, "Improving Broadband Access in Rural Areas" by Ingjerd Skogseid, explores the characteristics of rural broadband infrastructure development. Taking the existing installed base into

consideration, small rural communities can initiate bottom-up cultivation of broadband infrastructure. Such initiatives are important contributions to overcoming the disparity in broadband access. The proposal is to use descriptive clusters as a way to reveal the installed base. This can be used to acquire an overview of the types of resources available and the choices that need to be made.

Chapter XIII, "Metropolitan Broadband Networks: Design and Implementation Aspects, and Business Models" by Antonios Alexiou, Christos Bouras, Dimitris Primpas, and John Papagiannopoulos, presents the design principles that cover the implementation of broadband infrastructure in the region of Western Greece, by examining all the necessary parameters that arise while implementing such a critical developmental project. The broadband infrastructure that is deployed is either based on optical fiber or on wireless systems. The usage of the broadband infrastructure by service providers will be based upon the open availability of the infrastructure in a cost-effective way. This chapter also presents the main characteristics of a proposed business plan that ensures financial viability of the broadband infrastructure and guarantees the administration, growth, and exploitation of the infrastructure.

Chapter XIV, "Small World: The Irish Broadband Experience" by Diana Wilson, Kevin O'Reilly, and Dave Murray, considers the political, cultural/social, and economic factors, both micro and macro, affecting the supply/demand nexus of broadband services for the Irish consumer. This chapter suggests that although the market is beginning to grow strongly, it is from a low base, and as a result the country still lags behind many of its European counterparts. There is still a lack of competition which is having an adverse effect on both the supply and demand of broadband. Also, the Irish consumers are still not convinced that broadband is the 'killer app' they need. The authors conclude that this may change in the future as the technology delivers more of the content-rich multimedia fare that the Irish already enjoy in other formats.

Chapter XV, "Social, Political, and Ethical Responsibility in Broadband Adoption and Diffusion: A German Case Study" by Axel Schulz, Bernd Carsten Stahl, and Simon Rogerson, suggests that there is considerable interest worldwide in broadband diffusion, with research focusing on aspects such as the provision of broadband in remote areas and the socio-economic factors that determine the likelihood of adoption. This chapter identifies the policies and initiatives used to encourage broadband awareness, availability, and adoption. Using the case study of a local broadband initiative in remote and rural Germany, the chapter asks the question of who can and should be responsible for broadband provision and how such responsibility ascriptions are realized.

Chapter XVI, "Competition in Broadband Provision and the Digital Divide" by Wei-Min Hu and James E. Prieger, examines the supply of DSL broadband by the incumbent local exchange company (LEC) in five U.S. states in the earlier years of deployment. Empirical analysis shows that income, other demographics, and cost factors are important determinants of entry and availability. After controlling for other factors, the racial characteristics of the area do not affect DSL provision. Active competition in broadband from competitive LECs reduces deployment of DSL by the incumbent, but potential competition from competitive LECs has the opposite effect. Competition from cable companies also negatively influences the incumbent's decision to supply DSL. The authors' objective in gauging the importance of the various factors is to highlight the important drivers of broadband provision for policymakers.

Chapter XVII, "Governmental and Cultural Factors in Broadband Adoption" by Elizabeth Fife, Laura Hosman, and Francis Pereira, suggests that although the potential benefits of broadband Internet adoption are great, the levels of take-up vary greatly around the world. This chapter argues that the high level of broadband adoption rates witnessed in certain Asian economies is attributable in part to the aggressive policies pursued by the respective governments. The chapter concludes by suggesting that even if economic and social benefits exist, as in the case of telemedicine in the United States, cultural and social factors may in fact hinder the deployment of such applications and retard the growth rate of broadband access.

Chapter XVIII, "Regulation and the Deployment of Broadband" by James E. Prieger and Sunhwa Lee, examines the impact of telecommunications regulatory policy on broadband service deployment. Using U.S. data covering all forms of access technology and all areas served by major carriers, the authors investigate the impact of state and federal regulations on broadband availability. The authors' objective in examining regulatory factors is to highlight the role of incentive regulation and local telecommunications competition policy in stimulating broadband service deployment.

Section II: Consumer-User Behavior examines the micro and demand-side factors affecting broadband adoption and usage in various national settings grouped into five divisions (Australia, Europe, Middle East, North America, South America). Chapters included in this section provide in-depth discussion on socio-behavioral, attitudinal, and demographic factors affecting adoption of broadband and the digital divide at the consumer level. This section also focuses on broadband user behavior and characterization. Nine chapters are included in this section which are grouped into five divisions according to their geographical orientation as follows: **Division I. Australia** (Chapter XIX: Factors Affecting Broadband Adoption for Mainstream Consumers); **Division II. Europe** (Chapter XX: Developing a Dynamic View of Broadband Adoption, Chapter XXI: Employing the Content Validity Approach for Improving the Content of the Broadband Adoption Survey Instrument, Chapter XXII: Inside the Microcosm: A Case Study of a Wireless Internet Hotspot, Chapter XXIII: The Uses and Gratifications of Broadband Internet); **Division III. Middle East** (Chapter XXIV: Factors Affecting Attitudes towards Broadband Adoption in the Kingdom of Saudi Arabia); **Division IV. North America** (Chapter XXV: Characteristics of Farm and Rural Internet Use in the USA); **Division V. South America** (Chapter XXVI: Broadband User Behavior Characterization, Chapter XXVII: Precisions about the Broadband Divide in Chile).

Chapter XIX, "Factors Affecting Broadband Adoption for Mainstream Consumers" by Peter Adams, explores whether past experiences with telecommunications providers and current 'plans' on offer serve as barriers between an individual consumer's persuasion phase of the innovation-decision process and the decision phase. The author argues that future technology adoption studies need to consider including the complexity of the actual purchase decision when developing constructs for quantitative models. The chapter concludes by supporting that if we are to build a picture of why mainstream consumers adopt broadband, more than just the perceptions of using the technology itself need to be investigated.

Chapter XX, "Developing a Dynamic View of Broadband Adoption" by Herbert Daly, Adrina Ortiz, Yogesh K. Dwivedi, Ray J. Paul, J. Santos, and J.M. Sarriegi, develops a view of UK broadband adoption using dynamic modeling techniques based on an existing statistical study. The contrasting approaches to modeling are compared. Principles of a dynamic modeling system are introduced, and an appropriate form for broadband adoption chosen. The process of building a dynamic model based on an existing static model of broadband adoption is presented. Finally, the new perspective of the dynamic model is explored using the causal loop analysis technique.

Chapter XXI, "Employing the Content Validity Approach for Improving the Content of the Broadband Adoption Survey Instrument" by Yogesh K. Dwivedi, Banita Lal, and Khalil Khoumbati, illustrates the validation of content of the broadband adoption survey instrument from the household consumer's perspective. This chapter firstly identifies constructs and their respective items that adequately cover relevant dimensions of factors that affect consumers in the domain of broadband adoption, and second, it determines whether the identified constructs and their respective items adequately covered the relevant dimensions. Validation of the identified items was performed, employing a variation of a quantitative approach to content validity. The findings obtained from the content validation are presented and discussed.

Chapter XXII, "Inside the Microcosm: A Case Study of a Wireless Internet Hotspot" by Pierre Vialle, Olivier Epinette, and Olivier Segard, highlights critical elements affecting the diffusion of broadband

wireless Internet at a hotspot location, through a case study. The research deals with a wireless Internet services project in the main Paris airport, and comprises two components. First, this chapter analyzes the emergence of a value chain for a new service, based on the cooperation of several firms. In particular, the authors show how different actors can or cannot position themselves on this value chain, according to their resources and capabilities. Second, the authors explore the perceptions and attitudes of business passengers in order to better understand the potential adoption and use of hotspot services, and provide a preliminary framework of analysis.

Chapter XXIII, "The Uses and Gratifications of Broadband Internet" by Karianne Vermaas and Lidwien van de Wijngaert, identified a small number of relatively homogeneous groups of Dutch Internet users (both broadband and narrowband), based on their usage patterns. Using individual and behavioral characteristics, the authors further investigated the nature of the different groups. This chapter presents five clusters of different Internet users, based on patterns of behavior. The results show that the Internet users in the sample consist of a large group that more or less conduct the same online activities. The results also show that narrowband and broadband users differ in their Internet behavior.

Chapter XXIV, "Factors Affecting Attitudes towards Broadband Adoption in the Kingdom of Saudi Arabia" by Vishanth Weerakkody, sets out to explore the reasons for the slow progress in broadband adoption and investigates the factors that may be affecting the adoption of broadband by Kingdom of Saudi Arabia (KSA) consumers. The key findings are that the factors with the main influence upon consumers' attitudes towards adoption of broadband are: (1) usefulness, (2) service quality, (3) age, (4) usage, (5) type of connection, and (6) type of accommodation. Contrary to prediction, socio-cultural factors such as regulation through filtration of broadband were found to have no significant influence on the adoption of broadband.

Chapter XXV, "Characteristics of Farm and Rural Internet Use in the United States" by Peter L. Stenberg and Mitchell Morehart, examines Internet use by farm and rural workers and proprietors using descriptive statistics and market demand analysis. The primary methodology used is categorical dependent variable analysis. The results indicate that income is a critical element, though other factors such as age of proprietor and rural-urban location are also significant in market demand determination.

Chapter XXVI, "Broadband User Behavior Characterization" by Humberto T. Marques Neto, Leonardo C.D. Rocha, Pedro H.C. Guerra, Jussara M. Almeida, Wagner Meira Jr., and Virgilio A.F. Almeida, presents a broadband user behavior characterization from an Internet service provider standpoint. Analysis uncovers two main groups of session request patterns within each user category: (1) sessions that comprise traditional Internet services such as WWW services, e-mail, and instant messenger; and (2) sessions that comprise peer-to-peer file-sharing applications. This chapter also analyzed and classified the e-business services most commonly accessed by users.

Chapter XXVII, "Precisions about the Broadband Divide in Chile" by Sergio Godoy E. and M. Soledad Herrera P., quantifies the adoption of broadband at the household level in Chile by assessing its impact on three types of digital divide: between users and non-users of the Internet, between usage at home and elsewhere, and between home broadband users and modem home users. In Chile, the main digital gap is still between users and non-users of the Internet, both in terms of age and education level. Income mainly affects the probability of having broadband access at home. Since broadband has rapidly expanded among all socio-economic segments, it is becoming less relevant as a predictor of access and Web usage.

Section III: Small and Medium-Size Enterprises (SMEs) examines the factors affecting broadband deployment, diffusion, and use by SMEs in various countries. Six chapters are included in this section which are grouped into two divisions according to their geographical orientation as follows: **Division I. Asia** (Chapter XXVIII: A Survey on the Adoption and Usage of Broadband Internet); and **Division II.**

Europe (Chapter XXIX: Broadband Access and Broadband-Based Applications: An Empirical Study of the Determinants of Adoption Among Italian SMEs, Chapter XXX: Broadband Diffusion to SMEs in the UK, Chapter XXXI: Environmental Drivers of E-Business Strategies among SMEs, Chapter XXXII: Exploring SMEs' Adoption of Broadband in the Northwest of England, Chapter XXXIII: External Pressures for Adoption of ICT Services among SMEs).

Chapter XXVIII, "A Survey on the Adoption and Usage of Broadband Internet" by Roya Gholami, John Lim, and Sang-Yong Tom Lee, argues that in spite of the increasing significance of broadband Internet, there are not many research papers explicitly addressing issues pertaining to its adoption and post-adoption. In an attempt to fill this gap, this chapter empirically verifies an integrated theoretical model, comprising the theory of planned behavior and the IS continuance model to examine factors influencing broadband Internet adoption and post-adoption behavior of some 1,500 organizations in Singapore. At the adoption stage, perceived behavioral control has the greatest impact on behavioral intention. The findings also suggest that, as compared to attitude, subjective norms and perceived behavioral control more significantly affect the broadband Internet adoption decision.

Chapter XXIX, "Broadband Access and Broadband-Based Applications: An Empirical Study of the Determinants of Adoption among Italian SMEs" by Massimo G. Colombo, Luca Grilli, and Cinzia Verga, looks to answer the question: Why do some small and medium enterprises (SMEs) adopt Internet broadband technologies, and others do not? Results of the econometric analysis reveal that: (1) among firm-specific characteristics, size and the firm's need to communicate are major determinants both of broadband connection and use of complementary applications; (2) among location-specific characteristics, the level of telecommunications infrastructure positively influences both connection and applications use; and (3) time-specific variables like those related to the actual and future price of the high-speed Internet connection affect SMEs' decisions to adopt broadband.

Chapter XXX, "Broadband Diffusion to SMEs in the UK" by Oluwasola Oni and Anastasia Papazafeiropoulou, argues that previous research on broadband focuses on home uses particularly for educational purposes with little attention to its adoption by SMEs. The authors argue that the existing diffusion of innovation theories are inadequate for the study of broadband diffusion, and they propose a more socio-technical approach for that purpose. This study can be useful for SMEs considering the adoption of new technologies such as broadband, as well as policymakers who seek to apply effective technological adoption policies.

Chapter XXXI, "Environmental Drivers of E-Business Strategies among SMEs" by Alessandro Arbore and Andrea Ordanini, analyzes environmental factors such as market position, competitive intensity, and institutional pressures. SMEs have been grouped according to their level of e-business involvement, in relation to the number of e-business solutions adopted so far. Three layers are proposed: excluded, tentative, and integrated e-business SMEs. The general conclusion of this chapter is that different models seem to explain exclusion and involvement.

Chapter XXXII, "Exploring SMEs' Adoption of Broadband in the Northwest of England" by Boumediene Ramdani and Peter Kawalek, explores the factors impacting SMEs' (small to medium-sized enterprises') adoption of broadband. The chapter investigates the technological, organizational and environmental factors impacting SMEs' adoption of broadband. Based on the ICT innovations adoption literature, the SMEs' broadband adoption framework is developed and empirically validated involving nine SMEs' key decision makers in the Northwest of England.

Chapter XXXIII, "External Pressures for Adoption of ICT Services among SMEs" by Andrea Ordanini and Alessandro Arbore, intends to emphasize the importance that external sources of pressure may have on the level of ICT involvement among small and medium enterprises (SMEs) in Italy. While past research tends to prioritize the role of endogenous conditions for the adoption of information and com-

munication technologies—that is, financial resources, organization conditions, management culture—the high dependence of SMEs on their environment requires paying special attention to external pressures as well. Both competitive and institutional pressures are proposed and tested through an ordinal regression model on a sample of 285 SMEs.

Section IV: Impact on Emerging Applications examines the impact of broadband on emerging ICT applications and business models. The chapters included in this section provide in-depth discussion of the impact of broadband on communication, society, and delivery of entertainment and health services to consumers and citizens. Eight chapters are included in this section, which is grouped into four divisions according to type of impact or industry sector to which they belong: **Division I. Entertainment Industry** (Chapter XXXIV: IPTV Business Model Analysis, Chapter XXXV: The Impact of the Internet on the Law and Economics of the United States Motion Picture Industry); **Division II. Health Industry** (Chapter XXXVI: Broadband for Health in Developing Countries, Chapter XXXVII: Improving Health Services via Advanced ICT Networks, Chapter XXXVIII: Remote Patient Monitoring in Residential Care Homes (Using Wireless and Broadband Networks); **Division III. Social Impact** (Chapter XXXIX: Social Consequences of Broadband Access in Japan); and **Division IV. Communication** (Chapter XL: Internet-Based Changes in Organizational Communication, Chapter XLI: Ubiquitous Communication via Residential Gateways).

Chapter XXXIV, "IPTV Business Model Analysis" by Kate Carney Landow, Michelle Fandre, Raghu Nambiath, Ninad Shringarpure, Harvey Gates, Artur Lugmayr, and Scott Barker, focuses on evaluating Internet protocol television (IPTV) business models from different service providers through the prism of the star model. The star model is a simple tool used to identify the strengths and weaknesses of different business models in an appealing geometric shape. To highlight how to use this tool, sample partnership models are analyzed to evaluate the strength of a combined service. This tool will help IPTV service providers, and all potential investors, to build or identify a sound business model for their target market. The star model is explored through multiple case studies in this chapter including CBS, AOL, Google, Sling Media, and YouTube.

Chapter XXXV, "The Impact of the Internet on the Law and Economics of the United States Motion Picture Industry" by Stanford L. Levin, John B. Meisel, and Timothy S. Sullivan, describes the far-reaching effects of broadband Internet access on the motion picture industry. It firstly provides a summary of the effects on the industry's business model: the Internet (particularly when combined with broadband connections) provides a new window for the movie studios to utilize in releasing their product. It next examines the ways that legal, political, and cultural environments are already influencing the industry's search for a new business model to replace the old. Finally, it draws on lessons from the music industry to predict how the industry will ultimately incorporate broadband technology into a new business model.

Chapter XXXVI, "Broadband for Health in Developing Countries" by Aradhana Srivastava, highlights the major issues in the use of broadband technologies in healthcare in developing countries. The technology has immense potential, but is also constrained by lack of policy direction and problems with access to technology and lack of suitable infrastructure in developing nations. However, given its crucial role in public health, comprehensive efforts are required from all concerned stakeholders if universal e-health is to become a reality.

Chapter XXXVII, "Improving Health Services via Advanced ICT Networks" by Peter Farr, Isabelle Ellis, and John Royle, describes an innovative broadband initiative that connects a group of general practices, medical specialists, hospitals, and other health providers in rural areas of Australia through a managed virtual private network (VPN). Being the first such health network of its kind in Australia, the project encountered challenges, and by overcoming these has been guiding government policy in respect to e-health. The chapter provides insights into the case study and should be a useful guide to any similar broadband network initiatives for the health sector elsewhere in the world.