Book Review

GIS Data Sources

By D. Decker. John Wiley & Sons, New York, Chichester, Weinheim, Brisbane, Singapore, Toronto, 2001. ISBN 0471 35505 4. 161 x 242 mm. x + 193 pages. Price £50.50 hardback.

Reviewed by R.A. Longhorn, Director, IDG (UK) Ltd

In one comprehensible volume of manageable size, the author has produced a useful introduction to a range of issues pertaining to access to spatial data plus a valuable list of sources of data suitable for use in Geographic Information Systems (GIS). Unfortunately for readers outside the USA, of the six appendices of sources, comprising fully one-quarter of the book, only two pages deal with data sources outside of America. Yet the well described links to key American spatial data providers, both private and public, should be a welcome starting point for anyone responsible for a new GIS application.

As the author states in the preface, the book "is not a GIS primer and is not intended to help you operate a GIS", rather the goal is "to help people locate the data they need". Due to the pace at which technology advances today, some of the material presented here, especially that related to Internet, telecommunications and computer technology, will be overtaken by events in our fast changing world. However, the role of these technologies in regard to creating, locating, accessing and using spatial data, as presented in this book, will not change dramatically.

In ten chapters, the author provides a review of the many types of spatial information available to a user, a general introduction to key issues on accessing and using spatial data in a GIS and trends in technology and spatial data itself that may impact how we use such data in the future. Each chapter introduces a 'GIS Data Law'; these are summarised collectively in Chapter 10. The nine 'laws' encompass the lessons presented in each chapter and are well worth reproducing and hanging above the desk of any GIS project manager!

The first four chapters, comprising a quarter of the book, cover such topics as basic spatial data types, terminology, physical data sources (imagery and vector data), the role of data in a GIS project and how to get the most from data in a specific application. While no single topic is covered in great detail, the strength of the presentation is in providing a general overview of how the topics are interrelated, which can be absorbed relatively easily and quickly.

Chapter 5 focuses on locating data from different types of sources. Although the examples are primarily drawn from experiences in America, the concepts of data clearinghouses, base maps, spatial data frameworks, metadata and related standards are universally applicable. For example, 'GIS Data Law 5' states "… you can learn a lot about a GIS dataset from its associated metadata. … Accurate, up-to-date metadata are essential to efficient GIS data exchange". Recognising the true importance of metadata is the first step for any GIS user to become a more proficient and efficient professional. The next step, finding appropriate data, is much more difficult, since it requires that literally tens of thousands of spatial data owners and producers also recognise how important metadata is and how complicated and costly is the path to creating high-quality, useful, fit-for-purpose metadata. This reviewer subscribes to the consensus of many international geographic information experts that the way to increase use of spatial data on a local, national, regional and global basis depends on the future development of metadata for all forms of geographically referenced data, not just the topographic data historically associated with GIS use.

While the technology aspects for accessing spatial data presented in Chapter 6 are interesting, the issues covered in the following three chapters are perhaps more relevant to the types of problems that GIS application designers and users must resolve if their projects are to be successful. Chapter 7 focuses on the pros and cons of creating spatial data where it doesn't exist with a 'how to' roadmap for implementing a successful data creation initiative. The discussion on buying or renting data mentions copyright, yet serious issues surrounding the legal aspects of data ownership are not sufficiently stressed. This reviewer has learned of a number of otherwise excellent GIS-based projects that succeeded technically, yet failed practically, due to unresolved conflicts regarding data ownership and exploitation. Legal issues appear again in a very short discourse on misuse of proprietary data in Chapter 9, but the book pays too little attention generally to such legal matters to be able to provide practical guidelines for spatial data users, whether experienced or new to the field.

Other omissions, some of which may be due to the very speed with which events move in the field of spatial information, GIS and the Internet generally, include insufficient attention to the work of the Open GIS Consortium (OGC) in regard to interoperability, to trends in specialised search engine development for spatial information,

to the appearance of Web-based search engines that can search databases as well as on-line Web pages and to rapid advances in XML (eXtensible Markup Language) applications, some of which are specific to spatial data (G-XML Geospatial-XML and GML Geography Markup Language). This book provides an introduction to many issues deal-ing with use of spatial information in a GIS, from creation to access to presentation of spatial data. Use of hypertext links in the body of the text, in the Notes section and in the extensive data sources appendices provide a useful starting point for those faced with the difficult task of locating spatial data suitable for their projects.

Interoperating Geographic Information Systems

Edited by M. Goodchild, M. Egenhofer, R. Fegeas and C. Kottman. Kluwer Academic Publishers, Boston, Dordrecht and London, http://www.wkap.nl, 1999. ISBN 0 7923 8436 9. 160 x 241 mm. xxii + 509 pages. Distributors: for North, Central and South America kluwer@wkap.com; for all other coun-tries orderdept@wkap.nl. Price NLG 330.00 / USD 159.95 / GBP 104.00 hardback.
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Readers who shy away from 'enhanced' conference papers published later as edited collections have nothing to fear from this excellent book. It provides a thorough introduc-tion to the concepts and competing theoretical views on interoperability in relation to GISs, as well as giving detailed project reports on how many of these concepts and theories are being put into practice, and concludes with a section on higher-level organisational, educational and infrastructure issues.

The 36 chapters are organised into four sections, com-posed of the extended papers of 79 contributors from 13 countries across many sectors of the GIS community; these papers were first presented at the Interop '97 con-ference, Santa Barbara, California, USA, in December 1997. The section editors are all extremely well known to the spatial information community and are eminently qualified to edit the sections for which they assumed responsibility in this major undertaking.

The format of the book is: Section 1 – Theory and Concepts (ed. M. Egenhofer) - 10 chapters; Section 2 – Modelling in Distributed Environments (ed. M. Goodchild) - 7 chapters; Section 3 – Systems and Experiences (ed. C. Kottman) - 13 chapters; Section 4 – Education, Institutions, and Markets (ed. R. Fegeas) - 6 chapters. For a topic which is evolving as fast as 'interoperability' in the IT world, virtually all of the content is still highly relevant, although much has happened in this arena during the 3 years since most of the papers were written or updated, e.g. appearance of many new Open GIS Consortium interoperability specifications, completion of much of the global geomatics standardisation work of ISO TC 211, appearance of tools and demonstration systems for Web Mapping, and development of the Semantic Web.

In the introduction to Section 1 on 'Theory and Concepts', section editor Max Egenhofer points out that interoperability of information systems has been a topic of discussion for more than two decades within the IT indus-try generally and that some aspects have been imple-mented outside the GIS arena for many years. Chapter 2 reviews that history, across three generations of interop-erability attempts at theoretical and practical levels: emphasis on data and data management in the 1980s; spread of the Internet and emergence of the Web accom-panied by proliferation of a wide variety of data of many new types in the 1990s; the current focus on information and knowledge versus data via 'semantic interoperability … supporting high-level, context-sensitive information requests'.

Chapter 3 focuses on the need for a unified theory of spa-tial information to underpin interoperability at the func-tional and practical level. Many parts of this theory exist, "if only the results already achieved can be integrated". Yet the very diversity of spatial information and its rapid evo-lution mean that it "may be too complex to be covered by a single, exhaustive, and useful theory", according to chap-ter author A Vckovski; such theory as may ultimately be agreed will look "very much like a standardisation docu-ment" – a sobering thought indeed.

The 'road map to interoperability' follows a linguistic par-allel presented by Kotmann (OGC), the author of Chapter 4, describing an approach that might help overcome the dual challenges of rapid technological development and consensus building. Both are key aspects in achieving interoperability of data and systems across the highly diverse spatial information communities using a finite set of GIS and IT tools. In this reviewer's direct experience, consensus is the more difficult of these challenges, whether it is in regard to interoperability specifications for GIS or defining the spatial data infrastructures that depend upon such interoperability for their ultimate suc-cess. OGC's current record of successes in regard to

achieving meaningful interoperability consensus is to be admired.

Continuing with theoretical aspects of interoperability, Chapter 5 examines the notion of 'information communities', offering definitions and highlighting problems caused by their heterogeneity (semantic, schematic and syntactic). A proposed way forward is to use 'semantic translators' between communities on the premise that 'solving semantic heterogeneity between applications will pave the road to true applications interoperability'. A complementary model for the exchanging of semantics between different systems is presented in Chapter 6, addressing abstract properties, geographic models, physical data structures and system details. Semantic interoperability is also the focus of Chapter 7, which describes a design approach for facilitating information exchange between GISs, while retaining meaning, using the concept of boundary objects based upon the premise that technology is not separate from social endeavours and should not be treated in isolation.

The final three chapters of Section 1 look at different aspects of implementing interoperable GIS, Chapter 8 drawing parallels between device drivers, their associated languages and the impact that Java may have on the future of GIS interoperability. Chapters 9 and 10 discuss approaches to interoperability based on distributed object management systems and formal specification languages, respectively, rounding out a very thorough exposition of the many different aspects of the theory and concepts of interoperating GISs promised in the introduction.

In Section 2 its editor, Michael Goodchild, provides the introduction to 'Modelling in Distributed Environments'. Three chapters focus on Web-based technology for serving spatial information over the Internet and locating information on the Web via metadata. The innovative iNovaGIS ActiveX server described in Chapter 12 creates an interface to spatial information that can be queried by a range of software modules developed in a range of languages, not just by a GIS. An agent-based information broker prototype system specific to spatial data is described in Chapter 16. Problems with metadata are addressed in Chapter 17, which proposes an automated metadata interpreter comprising different tools available at the time of writing as a prototype system. Three other chapters in Section 2 deal with various aspects of modelling geospatial information such that it can be effectively processed, stored or retrieved across platforms.

Section 3 comprises more than a third of the book, containing 12 detailed descriptions of projects or systems that focus on software or Web component design, or information portrayal and data enabling problems. As section editor Clifford Kottman says in his introduction, these chapters truly show the full complexity of the interoperability challenge, which includes both 'problems and meta-problems'. The problems arise from functional needs of any one application and can be solved with appropriate technology and ingenuity. The 'meta-problems', however, focus on 'the architecture of software component technology … middleware … even more daunting than the problems'. To highlight the diversity of GIS needs within spatial information communities, the projects presented span land information, geology, earth observation, a national SDI implementation, tourism systems, digital libraries, cable TV and cadastre.

The final section, edited by Robin Fegeas, contains five chapters looking at organisational, educational and infrastructure aspects of interoperability. In his introduction, Fegeas notes that interoperability does not affect just the technologist, but the rapidly changing paradigms also affect 'the bureaucrat, the teacher and the businessperson' as well. Chapter 32 compares organisational aspects of different environmental spatial information infrastructures in the USA while Chapter 36 looks at the digital library as an interoperable organisation system. Chapters 33 and 34 examine Internet marketplaces and market infrastructure, an information and commercial environment within which spatial information is traded and via which future GIS applications will be provided using Web Mapping technologies. Finally, issues and scenarios for GIS education in an 'interoperable future' are examined by three noted GIS distance education academics.

In conclusion, this is an excellent blend of the theoretical underpinnings for GIS interoperability brought to life by a dozen in-depth descriptions of real-world efforts to solve parts of the interoperability dilemma, concluding with a look at organisational, infrastructure and educational aspects. Good use is made of hypertext links in both the main text and in the Consolidated References, which number several hundreds, occupying fully 24 pages of the book. For those spatial information project developers and users who are besotted with their technology, this book provides a much needed introduction and reminder of the true extent of the problems underlying our inability to achieve greater GIS interoperability (so far) without continued commitment to both research and application of that research.