READINGS IN

Electronic Commerce

Edited by

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ADDISON-WESLEY

An imprint of Addison Wesley Longman, Inc.
Reading, Massachusetts • Harlow, England • Menlo Park, California
Berkeley, California • Don Mills, Ontario • Sydney • Bonn • Amsterdam
Tokyo • Mexico City

Acquisitions Editor: Thomas E. Stone
Associate Editor: Deborah Lafferty
Production: Editorial Services of New England
Project Manager: Jane Judge Bonassar, Editorial Services of New England
Cover Designer: Loren Hilgenhurst Stevens
Illustrations: Scientific Illustrators
Composition: Compset Inc.

Library of Congress Cataloging-in-Publication Data

Readings in electronic commerce / edited by Ravi Kalakota, Andrew Whinston.
p. cm.
Papers presented at the sixth Organizational Computing, Coordination, and Collaboration Conference, held in Austin, Texas in October of 1995.
Includes bibliographical references and index.
ISBN 0-201-88060-1
1. Electronic commerce—Congresses. I. Kalakota, Ravi. II. Whinston, Andrew B. III. Organizational Computing, Coordination, and Collaboration Conference (6th : 1995 : Austin, Texas)
HF5548.3.R43 1997
658.8'00285' 467—dc20 96-27588
CIP

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http://www.aw.com/cseng/

1 2 3 4 5 6 7 8 9 10-MA-0099989796

Preface

The majority of the chapters in this book are based on papers presented at the Sixth Organizational Computing, Coordination, and Collaboration Conference held at the IC^2 Institute in Austin, Texas, in October 1995. The purpose of this conference was to address research issues facing academia and industry in the age of electronic commerce. Experts in the field of electronic commerce came together with the goal of helping companies to better understand the shape, structure, and operation of business in the coming millennium.

As the fastest-growing facet of the Internet, electronic commerce offers functionality and new ways of doing business that no company can afford to ignore. The basis for moving to an electronic commerce is a belief that electronic markets have the potential to be more efficient in developing new information goods and services. In addition, electronic commerce also offers companies new ways of finding global customers and trading partners. The Sixth Organizational Computing, Coordination, and Collaboration Conference was aimed at promoting electronic commerce research and practice. Electronic commerce is expected to make obsolete much of the accumulated research in business and to create and demand radical changes in the process, product, and promotion to better exploit the digital platform.

This emerging electronic marketplace is an uncharted frontier, and, much like the "Wild West" of the past, needs to be tamed. The challenge is simple: using emerging technology, how do we create a business environment or infrastructure that will ensure efficient electronic markets? What does it take in terms of new organizational structures like the network structures facilitated by smart and wireless messaging; new electronic institutions such as brokerages staffed by electronic brokers or agents; new business processes better suited for mass customization, global sourcing, and logistics; and new financial payment mechanisms and mercantile protocols?

To explore and exploit new frontiers, we need to integrate business concerns with the changing technology. This conference sought to provide this integration by bringing together leading business researchers who specialize in the various facets of electronic markets—namely, economics, finance, marketing, production, and operations management—and technology experts in the industry who are creating the electronic commerce infrastructure. In addition, experts who specialize in the WWW browsers, electronic cash, encryption, software agents, MIME-based messaging, EDI, and structured documents made presentations.

It is no longer sufficient for electronic commerce to be viewed as a path-breaking technology. Electronic commerce is already playing a significant role in determining the strategy of today's companies in providing value to external and internal customers. The challenge facing companies is to increase the effectiveness of electronic commerce activities in order to achieve business performance. As successful organizations have taken a process-oriented view of their business, they will have to reevaluate the role of electronic commerce in terms of alignment with corporate goals.

This book is divided into five parts. Part One, an introductory overview of electronic commerce, includes three chapters. The first, "An Unaffiliated View of Electronic Commerce," by David H. Crocker, discusses the reasons that the Internet will serve as the global conveyor of transactions for on-line commerce. It also discusses the nature of the technical and operational concerns of electronic commerce and offers solutions to these problems. Chapter 2 by Donna L. Hoffman, Thomas P. Novak, and Patrali Chatterjee explores three main issues associated with the explosion of commercial activity on the Web. Dr. Hoffman explores the role of the Web as a distribution channel and a medium for marketing communications, the factors that have led to the development of the Web as a commercial medium, and finally, the barriers to commercial growth of the Web from both the supply and demand side perspectives. Chapter 3, "An Evaluation of the World Wide Web as a Platform for Electronic Commerce," by Daniel W. Connolly, evaluates the Web with respect to each of Douglas Englebart's twelve requirements for an open hyperdocument system. Englebart's requirements are derived from experience in using computer-supported collaborative work (CSCW) to support large-scale electronic commerce.

Part Two is entitled "General Business and Policy." The first of three chapters in this section is entitled "Electronic Commerce: A Washington Perspective." Its author, James B. Rapp, seeks to make those involved in electronic commerce aware that public policy issues need to be on their "radar screens" when making business decisions, as they will impact pricing, service/product offerings, and marketing approaches.

One of the most politically controversial areas in electronic commerce is the right of governments under certain legally defined conditions to get access to private information. In Chapter 5, Dorothy E. Denning outlines the issues of establishing worldwide standards for creating and managing key escrows by trusted third parties that recognize the competing needs for privacy and governmental disclosure.

"The Essential Role of Trusted Third Parties in Electronic Commerce" by A. Michael Froomkin is the title of Chapter 6. In this chapter, Froomkin discusses the idea that cryptographic protocols for secure electronic

transactions require that there be at least one trusted third party to the transaction, such as a bank or a "certification authority" (CA). These partly cryptographic, partly social protocols require new entities, or new relationships with existing entities, but the duties and liabilities of these entities are uncertain. Until these uncertainties are resolved, they risk inhibiting the spread of the most interesting forms of electronic commerce and causing unnecessary litigation. CAs do explain why these entities are important to electronic commerce and suggest that these entities are likely to provoke some interesting legal problems.

Part Three, "Pricing and Electronic Transactions," contains three chapters. Chapter 7, by Nathaniel S. Borenstein and coauthors, discusses the lessons First Virtual learned from a year's experience with the actual operation of its Internet Payment System, as well as the company's views on the future of First Virtual's Internet Payment System in particular, and on Internet commerce in general. Alok Gupta, Dale O. Stahl, and Andrew B. Whinston discuss "Economic Issues in Electronic Commerce" in Chapter 8. They focus on the economic challenges in this market and present some simulation results from the point of view of social welfare and optimal resource management. They also describe the difficulties of sustaining the socially optimal behavior because of the private market competition and the lack of property rights. Finally, Chapter 9, by B. Clifford Neuman, discusses the design of a flexible framework for network payment. Several payment models, including the NetCheque® and NetCash systems, are presented and their characteristics discussed. These two systems, developed at the University of Southern California, show how the design of a payment system can influence its flexibility by minimizing system-imposed constraints on the policies implemented by servers.

Part Four, entitled "Document Management and Digital Libraries," includes two chapters. Chapter 10 by Larry Masinter discusses electronic document management, reviews assumptions for future networking capabilities and electronic commerce, and presents an overview of four kinds of document management applications. It also explores the ways in which the network will change the nature of document management for each of those applications. In Chapter 11, "Smart Catalogs and Virtual Catalogs," Arthur M. Keller presents an architecture for electronic catalogs.

Business applications of electronic commerce are discussed in Part Five. The purpose of Chapter 12, by Aimo Hinkkanen and colleagues, is to describe an information system used in a real-time environment which can be employed to manage and control all activities in the supply chain. In Chapter 13, entitled "Electronic Markets," R. Preston McAfee and John McMillan present a radical new way of conducting auctions in the electronic

environment. This chapter explains how electronic markets may function in creating allocations of goods and services where traditional supply and demand work poorly.

In Chapter 14, Ramnath Chellappa, Anitesh Barua, and Andrew B. Whinston discuss one of the industry's fastest-growing segments: corporate Intranets. Finally, Chapter 15, "Electronic Publishing versus Publishing Electronically," by Ramnath Chellappa, Anitesh Barua, Jennifer Oetzel, and Andrew B. Whinston, presents a revolutionary new way of utilizing Internet technology. The chapter shows how Marshall McLuhan was right when he said "The medium is the message."

In summary, investments in electronic commerce, whether in time or money, typically introduce far-reaching organizational and technological issues. It is no longer sufficient for electronic commerce to be viewed as a path-breaking technology. Electronic commerce is already playing a significant role in determining the strategy of today's companies in providing value to external and internal customers. The challenge facing companies is to increase the effectiveness of electronic commerce activities in order to achieve business performance. As successful organizations have taken a process-oriented view of their business, they will have to reevaluate the role of electronic commerce in terms of alignment with corporate goals.

Acknowledgments

We are deeply indebted to George Kozmetsky and the RGK Foundation for their financial support of the Sixth Organizational Computing, Coordination, and Collaboration Conference. Without their support, the conference would not have been possible. Cynthia Smith, Melissa Brown, and Jami Hampton, RGK Foundation staff, deserve special thanks for their flawless organization and execution of the conference. In addition, financial support from the Information Technology and Organizations program at the National Science Foundation helped make this a first-class conference and an international event. We especially wish to thank the program managers, Drs. Su Shing Chen and Les Gasser.

We would also like to thank Robert Sullivan, the Director of IC^2, for his support and for allowing us to use IC^2's conference facilities. We felt particularly fortunate because the acoustics and architecture of the IC^2 complex make it uniquely suited to facilitating a lively exchange of ideas in an attractive environment. Debbie Lafferty, associate editor at Addison Wesley Longman, was amazingly patient from beginning to end, and her guidance along the way was invaluable. Finally, thanks goes to Jennifer Oetzel for her superb editorial work. She deserves our sincere gratitude for efficiently assembling the conference papers.

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Anitesh Barua is an assistant professor of information systems and associate director of the Center for Information Systems Management in the Department of Management Science and Information Systems, Graduate School of Business, University of Texas at Austin. He received his Ph.D in information systems from Carnegie Mellon University in 1991. His research interests include IT productivity and business value, complementarity between IT and organizational design, trading partner selection over electronic networks, and the design of Internet- and Intranet-based collaborative systems. Dr. Barua has received several awards for his research and teaching, including the William W. Cooper Doctoral Dissertation Award in Management and Management Science from Carnegie Mellon University, and the CBA Foundation Teaching Award for Assistant Professors from the University of Texas at Austin. His research papers have been published (or are scheduled to appear) in leading journals and conferences, including *Decision Support Systems; IEEE Transactions on Systems, Man and Cybernetics; International Journal of Flexible Manufacturing Systems; Information Systems Research; Journal of Organizational Computing; MIS Quarterly;* and *Organization Science.*

Nathaniel S. Borenstein

Nathaniel S. Borenstein is a founder and chief scientist of First Virtual Holdings, Incorporated. Previously a researcher at Bellcore and Carnegie Mellon University, he is a primary author of MIME, the Internet standard format for interoperable multimedia data, and the author of various widely used software packages, including metamail™, Safe-Tcl™, ATOMICMAIL™, and the Andrew Message System™. He specializes in end-user interfaces and is the author of the book *Programming as If People Mattered.*

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Ramnath Chellappa is a doctoral candidate and assistant instructor in the Department of Management Science and Information Systems at the University of Texas at Austin. He is also a research associate at the Center for Information Systems Management, where he conducts research in the areas of client/server architecture, data communication, electronic commerce, and Internet and Intranet technologies. He is also the architect of *EC World,* an on-line electronic journal on the Internet. Mr. Chellappa, who has a background in mining and petroleum engineering, worked as a UNIX systems analyst before entering the doctoral program at the University of Texas. His research papers have appeared in the *Journal of Organizational Computing* and the *Handbook of Human Factors and Ergonomics,* among others. Mr. Chellappa expects to graduate in May 1997.

Daniel W. Connolly

Daniel W. Connolly, a research associate at the Massachusetts Institute of Technology/W3C, discovered the Web project soon after graduating from the University of Texas at Austin in 1990. His industry experience in on-line documentation tools, distributed computing, and information delivery kept him in touch with the project while he was at Dazel and HaLSoft. His background in formal systems led him to work on the specification of HTML and other parts of the Web.

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David H. Crocker is a principal with Brandenburg Consulting, providing strategic business, marketing, and technical planning and design for networked applications. Mr. Crocker assists clients in developing and using Internet products and services. He has participated in the development of internetworking capabilities since 1972, first as part of the Arpanet research community and more recently in the commercial sector. Mr. Crocker has been a key contributor in the development of Internet Mail, as well as developing MCI Mail. He has worked at a number of Silicon Valley companies,

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Aimo Hinkkanen studied mathematics at the University of Helsinki, Finland, and received a Ph.D. in 1980. He has held faculty positions at the University of Michigan and the University of Texas at Austin. Currently he is professor of mathematics at the University of Illinois at Urbana-Champaign. He has been an Alfred P. Sloan Research Fellow. Dr. Hinkkanen's principal research interests are in complex analysis, particularly complex dynamical systems and quasiconformal analysis.

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Donna L. Hoffman is an associate professor of marketing at the Owen Graduate School of Management at Vanderbilt University. She jointly directs Project 2000, a research program in computer-mediated marketing environment, which is devoted to studying the marketing implications of commercializing the World Wide Web. Examples of current projects include (1) developing the strategic marketing implications of commercial scenarios of the Web; (2) modeling consumer response to advertising and consumer search

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