

Praise for *Information Science*

'In *Information Science*, Seadle takes a hitherto unforeseen, and yet a novel and multifaceted approach to discuss the evolution, implications and applications of information as a concept, and information science as a discipline. The discussions, observations and commentaries appearing in the chapters throughout this book are a product of Seadle's rich knowledge, research and scholarship, and senior management experience in the field of information science at national and global levels. This is a must-read for anyone who wants to know and understand the role of information in the evolution of our society from the stone age to the modern era of Artificial Intelligence.'

Gobinda Chowdhury, Professor of Information Science, University of Strathclyde and co-author of *AI and Information Access*

'Michael Seadle draws on his extensive background in information science to present an account of how information and its institutions have evolved over time, and why and how information matters now. Drawing together themes of language, culture, technology, and integrity, this work offers readers a framework for understanding the field's development and its ongoing relevance, situating contemporary debates within a broader historical context.'

Heather Moulaison-Sandy, Associate Professor, School of Information Science and Learning Technologies, University of Missouri, USA

'This book navigates the universe of information science, brilliantly illuminating all the galaxies (theories) and stars (concepts), and masterfully explains them in a plain and easily understandable way. This book is essential for anyone with an interest in the field of information science. I am rebuilding my Information Management 101 class using this book. I am sure students will love it!'

Lihong Zhou, Professor (Full) and Associate Dean, Wuhan University, China

Information Science

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information professionals.

Information Science

History, Ideas, Applications

Michael Seadle

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About the Author

Michael Seadle, PhD, is a full professor at Humboldt-Universität zu Berlin, where he has served since 2006 in various roles as director of the School of Library and Information Science (2006–18), as Dean of Humanities (2010–16), University Council Chair (2015–17), member and chair of the Commission Wissenschaftliches Fehlverhalten (Commission on Research Malpractice) (2014–18). Before coming to Berlin, he served in a variety of library capacities at Michigan State University Libraries including Assistant Director for Information Technology and Head of the Digital and Multimedia Center (1998–2006). He chaired the iSchools ‘iCaucus’ (2012–13) and was one of the signatories of the iSchools incorporation in 2014. He served as Executive Director of the iSchools until May 2024. He was editor of the peer-reviewed academic journal *Library Hi Tech* from 1997 to 2016. He continues to serve on the editorial board of *Bibliothek Forschung und Praxis* (2007–) and as editor of *World Digital Libraries*. He has published a number of books, including *The Measurement of Research Integrity* (Routledge, 2021), *Quantifying Research Integrity* (Morgan Claypool, 2017) and *Educating the Profession: 40 years of the IFLA Section on Education and Training* (DeGruyter, IFLA Series, 2016). Earlier works include *Automating Mainframe Management: Using expert systems with examples from VM and MVS* (McGraw Hill, 1991) and his dissertation, *Quakers in Nazi Germany* (Progressive Publisher, 1978). Over the decades, he has received millions in grant money from the US National Science Foundation, the German Forschungsgemeinschaft and corporations like Elsevier.

Preface

The idea for this book came from the need to explain to a broader academic audience what 'information science' means in the modern world, because the term fits imperfectly within the narrower boundaries of modern academic disciplines. Andrew Abbott explains that disciplinary boundaries provide 'a general conception of intellectual existence, a conception of the proper units of knowledge' (Abbott, 2001, 130). Information science has the problem that it cuts across many 'proper units of knowledge' and may fit best with history, philosophy and the humanities, where ideas often matter more than jobs or applications.

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No one really writes a book of any substance on their own. Dinner-table conversations with my wife, a scholar and professor, played a role. I also want to acknowledge the real intellectual contributions of my friend and former doctoral student Elke Greifeneder, as well as discussions with Melanie Sterzer, Stefanie Havelka and my friend Gobinda Chowdhury.

Introduction

Identity

Information is ubiquitous, and that ubiquity is part of the problem when defining information science as a discipline. It lacks natural boundaries. In the *Chaos of Disciplines* (2001), Andrew Abbott explains why disciplinary boundaries are important: 'The first of these is the Geertzian function of providing academics with a general conception of intellectual existence, a conception of the proper units of knowledge.' In other words, disciplinary boundaries provide a basis for identity. This is particularly important when that identity determines where the discipline belongs within an organisation such as a university. One goal of this book is to describe information science in a way that makes its identity clear. Examples can help.

When a person comes to the reference desk of a library and asks for information about Berlin, Germany, in order to plan a trip, the librarian behind the desk will typically conduct a classic reference interview to learn about the person's information needs. This might include whether the person wants sightseeing options, a list of museums, background about the city's history, or perhaps an explanation of the city's social and political structure. Public transit information could be relevant. Hotels and restaurants could be relevant. The purpose of a reference interview is to understand the person's goals and to match them with available resources. Information in context is what matters, and each new detail can make the search more precise and more effective. Information scientists do a reference interview for every task they undertake.

Another everyday example comes from the decisions that a serious chef makes when preparing a meal. It is not merely a matter of recipes, but of finding the right ingredients in the store, knowing their nutritional value, what they cost and perhaps the ecological impact of the choices. Information about the cooking tools matters, such as knives, bowls, pots and pans, range

tops and ovens. Understanding the essential hand skills also matters for tasks like bread baking. Tactile information helps to decide how much liquid a dough really needs (recipes are not always accurate). Olfactory information plays a role in choosing spices and in determining whether an ingredient is fresh. The behavioural preferences and information about diners' allergies matter for choosing and excluding ingredients. This wide range of information cannot always be reduced to predefined lists or to mechanical processes. A good cook must think like an information scientist. Again, context matters.

A more technical example involves the installation of new software. While software generally comes with installation instructions, those instructions rarely satisfy more than a portion of the information needs. Knowing the capabilities of the computer hardware and the current version of its operating system matters. Possible interactions with other installed software should be considered. Details about the software vendor and the computing environment may determine long-term viability and how much support is likely available. The person doing the installation also needs training and expertise to solve unexpected problems. Knowing how to decipher error messages matters. Theoretically, all of this kind of information should be available in the documentation, but often is not. Knowing which information is relevant depends on the context.

A professional information scientist is always context aware, because context matters for almost every information choice. The core role of the information scientist is to integrate different streams of information into a whole that makes sense for a particular problem and can answer particular questions. Every scholarly field, and every practical one, needs people who can carry out such integrative tasks. They may not call themselves information scientists, but they are carrying out information science tasks by drawing together the necessary sources and resources.

Background

Information science is not just a product of the 'information age', which is a concept that grew in part from the work of Claude Shannon at the start of the computing era (University of Michigan, 2019). The role of information stretches back before the computer age, because information itself is at least as old as the earliest writing systems, and is arguably as old as or older than human speech. Everything humans do involves some form of information, and the range of types and ways of understanding that information are endless. An integrative 'science' of information is needed precisely because information as a concept is unbounded.

The word ‘science’ in modern English often implies a connection to the natural sciences, especially when used without a qualifier as in the ‘social sciences’, but the original English word had a meaning more like ‘*science*’ in French or ‘*Wissenschaft*’ in German, and described systematic knowledge. This original meaning is relevant when discussing modern information science. There was a time when the social sciences hoped to discover natural laws along the lines of the natural scientists. Claude Lévi-Strauss is just one example. Information science today does not and should not claim to be developing natural laws. It is pragmatic rather than theory driven. The role of language itself in information science will be discussed more completely in Chapter 4. This book focuses on how contemporary information science fits into modern scholarship. No academic field exists without its information components.

Vivien Petras offers a definition that builds on that of Michael Buckland. As she writes: ‘Information science, as implied by the name, could be defined as the discipline that studies information in all its forms and theoretical conceptions.... Information science is concerned with how information is manifested across space and time’ (Petras, 2023, 579–96).

This is consistent with the importance of being context aware, but with a slightly less historical emphasis, since Petras is not a historian.

Analogy with history

Information science is not unique in its breadth. History is equally broad because it covers the past in all of its aspects, just as information science is about information in all of its forms. A few notable historians, like Arnold Toynbee (1934–61), have tried to imitate the natural sciences by formulating theories about historical change, but without long-term success. History is too diverse to be reduced to algorithms.

Historical methodology is also not easily reduced to a unified set of approaches. One reason is that historians borrow tools and methods from all fields. Doctoral students in history must first learn what it means to think historically, which is a matter of consciousness rather than of technique. Understanding the past goes beyond discovering the right texts. As the French historian Marc Bloch (1953, 34) wrote, ‘to the great despair of historians, men fail to change their vocabulary every time they change their customs’. In other words, even clear labels can be misleading and the professional historian must look beyond them, much as an information scientist must look beyond simple labels or particular needs to understand the context of an information problem as a whole.

Like historians, information scientists are eclectic in their use of tools. The craftsman's principle applies here, because of the importance of selecting the right tool for the job, which may mean the right combination of types of information. Just as a fully trained carpenter knows which tool to use to cut a specific type of wood for a particular purpose, the well-trained information scientist needs to know how to select the right information out of all of the possible forms and types. As Bloch suggested for historians, labels can be misleading over time. The defining characteristic of an information scientist is the ability to see the whole context of an information problem.

Structure of the book

This book builds on a range of topics that show how information science fits in the scholarly and real world. The intellectual context is important precisely because information science is new as a discipline, although information itself is ancient. One important aspect of information science as a discipline is that it cuts across almost all contemporary academic subjects and integrates them in ways that expand their meanings.

Chapter 1: A History of Information

Information itself is older than any human awareness that information even exists. Modern concepts of information evolved as people began to understand the natural world and their own psychological world better. Reliable sources are an integral part of information science, as they have been for historians since the time of Herodotus in the fifth century BCE. From an information science viewpoint, the history of information is a search for authoritative sources.

Chapter 2: A History of the Discipline

Information science is a 20th-century concept that evolved from library science, since libraries manage the largest sources of scholarly information. When Daniel Atkins became dean at the University of Michigan and established its School of Information, he invited faculty from a broad range of disciplines to join the new iSchool. He wrote in 2003: 'Using advanced cyberinfrastructure must be done in a systemic context that exploits mutual self-interest and synergy among computer and information, and social science research communities who see it as an *object of research ...*'. This represents his vision of information science.

Chapter 3: Information Science Organisations

Most scholarly organisations are in fact information science organisations, because special kinds of information is part of their identity. Today, however, the leading organisations that explicitly claim an information science connection originated in the library community, including iSchools Inc., ASIS&T (Association for Information Science and Technology) and ALISE (Association for Library and Information Science Education).

Chapter 4: Language and Information Science

Language is one of the key sources of information, though not the only one. Words in different languages carry different meanings and connotations, which shape our understanding about information. One simple example is the word 'science', whose meaning varies with language, with context and across time.

Chapter 5: Culture and Information Science

Culture is the context in which people understand information. Even people conveying information in common terms may understand it differently because of different backgrounds. For example, in some cultures the institutional title 'professor' implies greater authority than 'doctor', which indicates only a level of education. The trust issues in analysing information sources often have cultural origins.

Chapter 6: Technology

Today, information and technology are so closely interrelated that much of the communication about information runs via technology tools. That is not new. Writing and, later, printing were once new forms of technology. Communication platforms can also influence the information itself.

Chapter 7: Internet Technology

In the minds of many people, the internet has become such a basic source of information that older forms of information access have lost their importance. Many people look online first to read news, to read e-mail and to chat with friends via social media. It has changed people's expectations.

Chapter 8: Information Integrity

Information integrity affects everyone inside and outside of the research community, and it is a matter of active debate. Recent examples of the importance of information integrity come from misinformation about the COVID-19 pandemic. Most universities have commissions to evaluate integrity breaches, but research into the causes of integrity violations is rare.

Chapter 9: Artificial Intelligence

Artificial intelligence (AI) usually refers to external systems that are capable of solving problems in ways that appear to resemble human thought. Information scientists should be aware that most systems with the means to make a variable response to external stimuli display some measure of intelligence. The idea of AI is old, even if the current name and the hype around it suggests something new.

Chapter 10: Information Behaviour

Information behaviour is a distinctive field with its own conference and an active leadership group. As a sub-discipline, it is relatively new. How people decide what information they want and what they do with it varies with social, cultural and historical situations. This includes the choices about what information people seek and how they use it.

Chapter 11: Data Science

Data science belongs to information science in part because it allows the quantification of many, if not quite all, forms of information. A few university programmes find the concept attractive because it implies a strong technical foundation. Some forms of information are best understood when quantified.

Chapter 12: Non-verbal Information

Non-verbal information includes all sources of information that do not primarily rely on the use of words as the means for communication. A facial expression such as a smile or a frown can indicate whether a person takes the information seriously or positively and whether or not the speaker trusts the information.

Chapter 13: Information Retrieval for Technology

Information retrieval is a historical carry-over from library science, but it has taken on much broader aspects as the complexity of information has grown to the point where searches succeed best when the searchers understand the context. This is an area where all the complexities of the information interactions play an important role.

Chapter 14: Information Curation

Research on information science topics requires long-term access to sources, which is one part of curation. The context of the sources also needs to be preserved, apart from the bits and bytes and books. Technology plays a role, as does metadata, in explaining what the information is. Open access for retrieval matters.

Chapter 15: Information for Education

Separating information from education is practically impossible. Many factors influence the information choices for educating students, some cultural, some political, some based on how best to make use of a student's abilities.

Chapter 16: Information and Politics

This conflict is particularly evident during times when democratic societies are making decisions about their futures, but it was never absent from political discourse in the past. Personal claims have often mattered more than reproducible facts.