CHAPTER 1

What is information science? Disciplines and professions

Information science is, or should be, involved with the whole concept of knowledge in whatever form its manifestations may take.

Jesse Shera (1973, 286)

Apparently, there is not a uniform conception of information science. The field seems to follow different approaches and traditions: for example, objective approaches versus cognitive approaches, and the library tradition versus the documentation tradition versus the computation tradition. The concept has different meanings, which imply different knowledge domains. Different knowledge domains imply different fields. Nevertheless, all of them are represented by the same name, information science. No wonder that scholars, practitioners and students are confused.

Chaim Zins (2007, 341)

The chunky concepts which make up our field's intellectual core (e.g. knowledge, information, communication, representation) are neither owned by information science nor likely to be assembled into an entirely credible canon without the judicious addition of perspectives and approaches taken from established disciplines such as computer science, linguistics, philosophy, psychology and sociology, as well as from newer fields such as cognitive science and human-computer interaction.

Blaise Cronin (2008, 466)

Let us not restrict ourselves to grubbing around in the garden patch of a limited, little information science, restricted to the relationship between information and machine. Instead, let us expand, reach out, embrace and explore the wider world of information, to develop a vision of information science as a central synthesising discipline in understanding not simply information, but the world we live in. Because the world we live in is surely a world of information.

Tom Wilson (2010)

Introduction

The subject of this book is information science. We begin by asking what information science is, as an academic discipline and profession. Obviously, and simplistically, it is the science of information. But what does this mean?

There are three main answers to this question (Buckland, 2012). One considers information science as being concerned with computing, algorithms and information technologies, a second with information as related to entropy in information theory and information physics, a third with information science as being concerned with information recorded in documents, with meaning and knowledge, and hence as growing from the older disciplines of librarianship and documentation. We will focus on the third of these in this book, although we will mention aspects of the other two at appropriate points. We will therefore be following the kind of definition which goes back at least as early as Borko (1968), and is expressed by Saracevic (2010, 2570) as:

> Information science is the science and practice dealing with the effective collection, storage, retrieval and use of information. It is concerned with recordable information and knowledge, and the technologies and related services that facilitate their management and use.

This gives us a general idea of the nature of the subject. But there is still scope for much difference in viewpoint as to exactly what the subject comprises. In the most thorough investigation yet, Zins (2007) reported fifty different explanations and definitions of information science, based on a Delphi study of experts. They ranged from circular arguments ('information science is what information scientists do') to the polemic ('information science is a self-serving attempt to ennoble what used to be called library science') to the very broad ('information science is the totality of the process of communication and understanding, both intra- and inter-personally'). Although they all had some concept of information at their centre, it is hard to see how they fit easily into any coherent single explanation of, or paradigm for, the subject. A range of other authors have expressed similarly diverse views as to the best way, in detail, to understand the information science discipline; see Robinson (2009) for details. Hjørland (2000) gives a thorough and detailed analysis of many aspects of the library and information disciplines to the end of the 20th century.

But we will need to examine it in more detail, following the approach put forward by one of us in a journal article (Robinson, 2009).

The nature of information science

Information science is clearly both an academic discipline and an area of professional practice. We will think first about the discipline, although we should

note that there have always been some doubts as to what extent it is a real discipline, still less a 'true science' (Robinson, 2009; Buckland, 2012).

One way to accommodate the wide range of views about, and diverse approaches to, the subject within a coherent framework is to regard information science as a *field of study*; using this phrase in the specific sense of Paul Hirst, the philosopher of education (Hirst, 1974). A field of study is an alternative to 'disciplines' based on a unique form of knowledge, such as mathematics or the physical sciences, and to 'practical disciplines' based on one of the forms of knowledge but oriented to solving practical problems, such as engineering or medicine. For Hirst, a field of study is focused on a topic or subject of interest, using any of the forms of knowledge – sociological, mathematical, philosophical etc. – which may be helpful in studying it. Bawden (2007a) argues that it may be appropriate to regard information science as such a field of study, focused on the topic of information. This is in order to keep the subject within sensible bounds, and also to restrict the focus to recorded information, produced and used by humans, as is also suggested by Bates (1999). Information science is then understood as:

> a multidisciplinary field of study, involving several forms of knowledge, given coherence by a focus on the central concept of human recorded information

This is reminiscent of the insistence of Machlup and Mansfield (1983) that the field should be described as the information sciences, emphasizing the plural, to show the breadth of approach needed; see Webber (2003) for more discussion of this. It is also in accord with Tom Wilson's rallying cry quoted at the beginning of this chapter (Wilson, 2010). We will follow this broad approach through this book.

We can go on, following Robinson (2009), to argue that we can give some more precision to this general idea by arguing that the focus on recorded information can be expressed specifically as a focus on the *communication chain* of recorded information: from its creation, through dissemination, indexing and retrieval, use, and archiving or disposal. This is implied in many earlier explanations of the subject, but noting it explicitly helps to clarify what are the concerns of information science. Details of the chain, and the ways in which it is being changed by new technologies, are discussed in Chapter 10.

We can then explain more precisely what an information scientist does, in terms of both research and scholarly study and of practice, through the components of *domain analysis*. We will discuss this more fully in Chapter 5. For now, we will just note that there are a number of aspects which represent

both the activities of the information practitioner and the ways in which research and study are carried out. Examples are user studies, historical studies, studies of terminology, research on indexing and retrieval, and so on.

This gives us a conceptual model for information science as an academic discipline, comprising the study of the components of the communication chain through the aspects of domain analysis. This is developed further in Robinson (2009). For our purpose, it gives us the understanding of information science which we shall use throughout this book.

> Information science can best be understood as a field of study, with human recorded information as its concern, focusing on the components of the communication chain, studied through the perspective of domain analysis.

The 'field of study' idea allows us to be relaxed about the varied approaches and methods which may be applied to information problems. However, there is still a concern, discussed by many authors, about what kind of discipline it is.

What kind of discipline is information science?

One way of assessing this is to see where the subject fits within the academic structure of universities. We would, for example, always expect to find physics and chemistry in science faculties, and thereby conclude that they were scientific subjects. However, the information sciences tend be dispersed. To take the example of a selection of departments of library and information science in universities in the British Isles at the time of writing (December 2011), we find them spread across faculties as follows: informatics (5), business schools (3), social sciences and human sciences (3), arts and social sciences (2), arts (1), education (1), science (1). The same is true in other countries. This shows the varied ways in which information science is viewed.

And, indeed, the literature shows a similar variety of views. It has been called, among many other things, a meta-science, an inter-science, a postmodern science, an interface science, a superior science, a rhetorical science, a nomad science, an interdisciplinary subject which should be renamed knowledge science, and a subject which may assume the role once played by philosophy in mediating science and humanism; see Robinson (2009) for references.

There has been a growing consensus over the years that information science is a social science; see, for example, Roberts (1976) and Cronin (2008). Domain analysis, which is fundamental to our view of the subject, is based on the idea that groups of people have common information practices and interests and concerns,

and is therefore primarily a social theory, and that this implies that information science is primarily a social science (Hjørland and Albrechtsen, 1995).

Or perhaps it is no sort of science at all; Arms (2005) and Buckland (1996a) suggested it might be seen as a liberal art, and Buckland (2012) argues that it is, above all else, a form of cultural engagement. The philosopher Luciano Floridi, of whom we will hear more in subsequent chapters, suggests that it is applied philosophy of information (Floridi, 2002).

Having formed an idea, though certainly not a precise definition, of what kind of discipline information science is, and what its focus of interest is, we can now ask what are its constituent parts, and whether there is an irreducible 'core' of the subject.

Constituents and core

Debates about what topics and subjects make up information science, and which of these are its essential 'core', have rumbled on in the literature for many years. They have typically taken two forms: attempts to enumerate the components of information science and attempts to produce 'maps', literal or metaphorical, showing how these parts fit together.

The curriculum for information science education has been much debated over the years; its core has been argued to comprise a variety of topics, including human-computer interaction, information literacy, information management, documentation, library management, knowledge management, information organization, information society studies, bibliometrics, information seeking, and information retrieval; see Mezick and Koenig (2008), Bawden (2007b), Lørring (2007) and Robinson and Bawden (2010). The recommendations by professional bodies, such as ASIST and CILIP, are correspondingly broad.

Mappings of information science, or the broader LIS, typically produced by the methods of informetrics to be discussed in Chapter 8, give similar results; for a review, see White (2010), and for recent examples, see Milojevic, Sugimoto, Yan and Ding (2011), Åström (2010) and Janssens, Leta, Glänzel and De Moor (2006). They typically identify informetrics, information retrieval, information seeking, information management and library/archive studies as major recognizable components.

We have to conclude that this confirms the picture of information science as a broad and diverse discipline, and that it is difficult to point to a small and unambiguous set of topics which comprise it. In this book, the chapter structure reflects our desire to be comprehensive as to the topics which are of importance to information science.

Although we have so far focused on information science itself, there are other information-related disciplines which link to information science from several different perspectives, and we now consider these.

Other information disciplines

Information science has overlaps with numerous other disciplines and professions. Indeed, because of its status as a meta-discipline, a little like philosophy or education, it can be seen to have links with all other disciplines, since all have some information and knowledge extensions, and hence information scientists may contribute to all (Bates, 1999; 2007). However, we will look here at those where there is an evident overlap in terms of common interests and concepts. The conceptual model discussed above allows us to analyse these in a rather formal way, showing how they are linked through one of the aspects of domain analysis; computing, for example, links through the indexing and retrieval component, and sociology and information society studies through the user studies approach (Robinson, 2009). Zhang and Benjamin (2007) have also offered an interesting conceptual model of information-related fields, which they collectively term the I-field. This is based on interactions of four components – information, people, technology and organizations and society – set within particular domains and contexts. However, here we will just look informally at six important overlaps: collections; technology; social; communication; management and policy; and domain specialism.

Collection overlap

Arguably the most evident overlap is with the collection disciplines and professions: librarianship, archiving and heritage, sometimes referred to as the GLAM (galleries, libraries, archives and museums) sector. Information science grew from a speciality – documentation and special librarianship – within this sector, and a composite field of 'library and information science' (LIS) is generally recognized, albeit with stresses and strains from the amalgamation of two distinct camps (Dillon, 2007), which Bates (2007) distinguishes as 'information sciences' and the 'disciplines of the cultural record'. Increasing convergence (or perhaps reconvergence, since these institutions often began as united entities) between the 'memory institutions' of this sector, in an increasingly digital environment, emphasizes this overlap; see, for example, Hughes (2012, part 1), Given and McTavish (2010) and Davis and Shaw (2011, Chapter 13). These aspects are discussed in Chapter 12.

Technology overlap

The other very obvious overlap is with the information technology disciplines: computer science and information systems. Information retrieval, digital libraries, repositories and similar areas, discussed in Chapter 7, are important overlap areas, as is the study of human-computer interaction; all of these have, at various times, been claimed as integral parts of information science.

Social overlap

The more information science is regarded as a social science, the more significant this overlap becomes. It is most clearly seen in information society and social informatics studies, discussed in Chapter 11.

Communication overlap

Technical communication, the writing of abstracts, translation, information design and so on have always been regarded as an area of interest to information science. There is also an overlap with journalism and publishing, and with the new area of digital humanities. These aspects are discussed further in Chapter 10. Through information and digital literacies, discussed in Chapter 13, there is a link to broader areas of communication and learning.

Management and policy overlap

Information management and information policy, generally regarded as within information science, naturally overlap with knowledge management, business intelligence and other 'general' management and policy-making areas, as is discussed in Chapter 12.

Domain specialism overlap

In the past, it was taken for granted that an information scientist would be some kind of a subject specialist; in legal information, medical information, scientific information, etc. This is no longer the case, but there is still an important overlap area between information science and the knowledge of a subject area. In healthcare, for example, subject expertise is still of great importance, and this has spawned the practitioner roles of 'clinical librarian', 'health informaticist' and 'informationist' (Robinson, 2010; Dalrymple, 2011; Brettle and Urquhart, 2012). To distinguish them from true subject specialists (doctors, in the previous example), it has been suggested that such people be called 'domain-generalists' (Hjørland, 2000).

These overlaps, and the 'field of study' status, imply that information science, whatever else it may be, is inherently multidisciplinary and interdisciplinary. This is often spoken of as a strength of the field, although there is a downside: Dillon (2007), for example, argues that the diversity of the field may prevent the establishment of an agreed core of methods and theories, as conventional disciplines have.

Given the number and extent of overlaps, and with other disciplines and professions concerned about 'information matters', it is reasonable to ask if there is any unique place for information science.

The uniqueness of information science

It is clear that many other professions are interested in components of the communication chain: publishers are concerned with dissemination, computer scientists with information retrieval, and so on. Even accepting that information science is a meta-discipline, surely it must have some 'academic turf' of its own? We, and others argue, that the uniqueness of information science lies in its concern for *all* aspects of the communication chain; others are interested in specific aspects, but only the information sciences see their concern as being the totality. We might also name some aspects of information organization and information behaviour, unaffected by technology or by context, which are the particular concern of the information sciences. But our main claim to a unique area is the totality of the communication chain; for more discussion, see Robinson and Bawden (2012), Robinson (2009) and Robinson and Karamuftuiglou (2010).

Another way in which the distinctive nature of disciplines is shown is by the questions which they set out to answer by research, and the problems they aim to solve in practice. There have been a number of sets of 'big questions' proposed for the information sciences. As examples, we can give two sets of three general questions for the field, proposed by two American professors, shown in the box below: the first set by Marcia Bates of the University of California, Los Angeles, and the second set by Andrew Dillon, of the University of Texas at Austin. All these questions are centred around information, all are complex and require a multifaceted approach to have any hope of success in answering them, and they combine theoretical understanding with practical value; good metaphors for the discipline as a whole.

To show the range of questions which might interest the information sciences in the broadest sense, we have have included two from the American physicist John A. Wheeler, whose ideas will be mentioned again in Chapter 4 when we discuss 'information physics'; the idea that information may be a feature of the physical universe, analogous to, or even more fundamental than, matter and energy. His 'Big Questions' related to physics and cosmology, but the two quoted here touch on information: is it the case that information is an underlying reality in the universe, and how does meaning emerge in the physical world.

We will now look briefly at the history and development of information science as a profession and discipline, at its professional bodies, and at the way in which information scientists have been, and are, educated.

History of information science

Information science first became known as a discipline during the 1950s. The terms 'information science' and 'information scientist' were first used by Jason Farradane in the mid-1950s (Shapiro, 1995). Farradane, a British scientist born in Hampstead, London, to Polish parents, was originally named Levkowitz, and

Some 'big questions' for the information sciences

What are the features and laws of the recorded-information universe?

How do people relate to, seek, and use information?

How can access to recorded information be made most rapid and effective?

Marcia Bates

What is the essential nature of information that might relate diverse endeavours (communicating, maintaining biological life, learning and finding) where the term is employed meaningfully?

How do we move from an information provision model (storage, retrieval, management etc.) to one where we identify and shape the manner in which information nourishes a culture, an organization or an individual?

How might we positively influence the cyberinfrastructure as the majority of the world joins us online?

Andrew Dillon

It from bit?

What makes meaning ?

John A. Wheeler

adopted his new name as a tribute to his scientific heroes, Michael Faraday and J. B. S. Haldane. Although his initial concept of an information scientist was a specialist in the handling of scientific and technical information, Farradane pioneered the teaching of information science as a distinct subject, and was among those who argued for a 'true science of information', along the lines of the natural sciences (Farradane, 1976; Bawden, 2008).

The emergence of the information science discipline was promoted by a number of causes. Although there have been librarians and archivists from the earliest days of writing and recorded information, formal information professions and disciplines came into existence only in the 19th century. The German librarian Martin Schrettinger used the term *bibliothekswissenschaft*, which may be reasonably translated 'library science', in 1808, to encompass the tasks of cataloguing, classification, shelf arrangement and library management.

Information science *per se* stems from the communications revolution of the 19th century, which will be discussed in the next chapter, and with the simultaneous emergence of scientific and technical disciplines (Meadows, 2004). The consequent need to deal with the large volumes of literature, and scientific and technical literature in particular, led to the emergence in the early 20th century of the *documentation* movement, pioneered by Paul Otlet, which espoused a 'scientific' approach to the storage and retrieval of recorded information.

There were other influences underlying the birth of information science, which we will briefly mention: for overviews and references on various aspects of the early history, see Robinson and Bawden (2012), Larivière, Sugimoto and Cronin (2012), Bawden (2008), Robinson (2009), Hahn and Buckland (1998), Williams (1997), Buckland (1996b), Buckland and Liu (1995), Ingwersen (1992), Meadows (1987), Rayward (1997, 1985), and Shera and Cleveland (1977).

The increased awareness of technical information as a resource for science-based industries led to the establishment of special libraries, and to the idea of 'information work' as distinct from librarianship. These, compared with traditional libraries, had a much more proactive role, a strong subject focus, and an interest in all forms of information, not just formally published documents (Ditmas, 1950). The need to deal with the 'information explosion', the very rapid expansion in publications of all kinds dealing particularly with scientific and technical information during and after the 1939–45 war, was discussed at the influential 1948 Royal Society Conference on scientific information.

The growing application of new technologies to information handling, initially mechanized documentation techniques, and then the digital computer, provided the technological background for the new science (Black, 2007). Vannevar Bush's influential Memex concept of personal information management with access to the world's information, combined with Shannon and Weaver's Mathematical Theory of Communication, and the new 'informetrics' laws, such as Bradford's law of scattering (all to be discussed in later chapters), held out the prospect of a genuinely scientific approach to information management.

The establishment of a new discipline or profession has typically been recognized, since the 19th century, by the setting up of a professional body to represent it. The first such body in the area that was to spawn information science was an international body for the co-ordination of the activities of the documentation movement. The Institut International de Bibliographie (IIB), later renamed as the International Federation for Information and Documentation (FID), was established by the two Belgian pioneers of documentation, Paul Otlet and Henri La Fontaine, in 1895. Lasting until the new millennium, it can claim to be the first recognizable information science association (Rayward, 1997).

On a smaller scale, several associations were set up for special librarians. The Special Libraries Association (SLA), founded in the USA in 1909, is still thriving as a worldwide body today; for an account of its development, see SLA (1984). In the UK, the Association of Special Libraries and Information Bureaux (ASLIB), was formed in 1924 with the aim of co-ordinating the activities of specialist information services in the UK and a role as a national intelligence service for science, commerce and industry (Muddiman, 2005). ASLIB still exists today, as an organization mainly promoting information management. National groups of

special librarians were formed in many other countries. The UK was rather slow off the mark, perhaps because of the existence of two other bodies catering for a relatively small sector; the Industrial Group of the Library Association was formed only in 1971 (Mason, 1991). It still survives, though now combined into a group also catering for commercial, legal and science librarians.

The two main bodies representing information science *per se* formed later, and had shorter lives in their 'pure' form. The American Documentation Institute, created in 1937, became the American Society for Information Science in 1968. It renamed itself as the American Society for Information Science and Technology in 2000. In the UK, the Institute of Information Science (IIS) was formed in 1958, and joined with The Library Association to form the Chartered Institute of Library and Information Professionals (CILIP) in 2002. While each association had its particular reasons for the change, the fact that both felt that it was sensible for information science to enter a wider grouping – with technology or with the collection disciplines – illustrates what was said above about its multidisciplinary nature.

Specialized journals are also a feature of a mature discipline. Of the major information science journals today, the longest-established is *Journal of Documentation*, the name reflecting its origins in the field of documentation when it was founded in 1945. Both the main information science associations founded journals: *Journal of the American Society for Information Science and Technology* (formerly *Journal of the American Society for Information Science*) in 1950, and the IIS's *Journal of Information Science* (formerly *The Information Scientist*) in 1967. The last of the major specific information science journals, *Information Processing and Management*, was founded as *Information Storage and Retrieval* in 1963. Of course, information science material is published in a much wider range of journals; some of the more significant of these are listed in the additional resources at the end of the book.

Finally we consider professional education. The first formalized educational programmes for the information sciences came with the establishment of courses in librarianship at the University of Göttingen in 1886, and the University of Columbia in 1887 – the latter established by Melville Dewey – and at Leipzig and Barcelona, both in 1915, followed by the creation of London University's School of Librarianship (later attached to University College London) in 1919. Graduate studies began at the University of Chicago in 1926, and in London a few years later. The first signs of an information science education came with a course specifically for science graduates in London in 1929, though this closed for lack of interest in 1935. Modern information science education began in 1961, when Jason Farradane set up an evening course in 'collecting and communicating scientific knowledge' at Northampton College of Advanced Technology. This led to the establishment of a Masters course in information science at the Centre for

Information Science when the College became City University London in 1965 (Robinson and Bawden, 2010). Other courses in the subject were developed worldwide in the following years, typically conjoint library and information departments (Um and Feather, 2007; Mezick and Koenig, 2008).

A new development in information education is the iSchools movement. Based mainly in the USA, with some international representation, iSchools are academic departments taking a broad view of information science, as the interaction of information, people and technology: the iField of Zhang and Benjamin (2007).

One recurrent question has been to what extent education in the information sciences should be focused on theories and principles, as against training in practical techniques. We strongly advocate the former, believing that it is much more valuable for students to gain an understanding of principles and concepts on which they can build throughout their professional lives, rather than ephemeral, and sometimes trivial, points of practice, and this has been the basis of our courses at City University London (Robinson and Bawden, 2010). We are encouraged in this viewpoint by evidence from studies of graduates (see, for instance, Simmons and Corrall, 2011), and by the views of two eminent figures from the past, who both had experience as practitioners and teachers: Jesse Shera from the USA and Brian Vickery from Britain:

> Librarianship can be an intellectual discipline in its own right, and education is not a substitute for experience, but a preparation for it. Librarianship . . . must abandon the practice of putting its students through 'little fake experiences in the classroom'. We must teach pupils theory, not techniques: principles, not practice.
>
> Jesse Shera (1973, 335)

> Only in a very static profession can one be trained to slot in immediately to an available job, and our profession is far from static. It is more beneficial for the students to give them a generalized grounding in a wide variety of professional activities and concerns, so that they will have some background knowledge for no matter what job is first available. For those who seek it, our subject also has its cultural value, which can contribute to a general education.
>
> Vickery (2004, 29)

This is our justification for focusing on principles and concepts, at the expense of practical details, in this book.

Summary

Information science has changed greatly in nature since its inception. Rather than forming a focused science of information, with its own methods and theories, it

has overlapped with other disciplines, making use of many and varied methods, and contributing some to other areas. Its practice has also changed. From a situation where most practitioners were subject-specialist information providers, often dealing with scientific information, we have moved to a point where they take a much wider variety of roles. We will review this diversity, and the principles and concepts which underlie it, in the rest of this book.

- It is sensible to speak of the information sciences in the plural, to emphasize the breadth, multidisciplinary nature, and interconnectedness of the field.
- It is a field of study, focused on recorded information, and requiring a variety of perspectives and methods.
- Growing out of special librarianship and documentation, it has strong links with IT and computing, and with the collection disciplines.
- Although it underlies and supports practice, it is a valid academic discipline in its own right, and educational programmes based on concepts and principles are the most valuable.

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[Four papers which present, in clear terms, differing views of the information sciences.]

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