Preliminary edition

Exploring information behaviour

an introduction

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Foreword

This book is an introduction to researching human information behaviour. It is not a book about the rich diversity of such behaviour as reported in thousands of research papers, PhD theses and reports to funding agencies. That job has already been done by Donald Case in his book *Looking for information*. It is, rather, very much a personal account, based to a significant extent on my own research and my own theoretical frameworks.

Inevitably, reference is made to the extensive literature, since the outcome of research into human behaviour is a greater understanding of the richness of that behaviour and of the complex interplay of factors that have an impact upon the information seeking individual. I try, however, wherever possible, to provide links to openly available sources, believing that the reader is much more likely to click on a link to find a related document than to try to discover a source for a cited document.

The book is aimed at the beginning researcher, perhaps preparing a Master's degree thesis, or beginning to think about doctoral research. By the time you reach the end of the book I hope that it will have achieved three things for you: first, you should understand what is meant by *information behaviour*; secondly, you should be more aware of the theories and models that guide our approach to research; and finally, you should have a sound understanding of the various research methods employed in information behaviour research and how to use them.

I hope to provide a readable introduction to the subject and that you will tell me about your experience of reading and using the book so that I might improve upon it in any subsequent edition. You can contact me at *wilsontd@gmail.com*

The text has benefited from having been read by a number of people at various times, who commented helpfully and drew attention to shortcomings. So, my thanks to (in alphabetical order), Marcia Bates,

Charles Cole, Nigel Ford, Ina Fourie, Elena Maceviciute, and Hester Meyer.
T.D. Wilson
Sheffield, 2020

Introduction

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In which we talk about the nature of information, the evolution of the media upon which it is recorded and other matters.

Introduction

Outline

The nature of information

Homo sapiens has been a seeker after information about the world from the beginning of the evolution of the species. In fact, we can say that information pervades the life of all species on the planet: whether or not they deliberately seek it, they all 'consume' it. To justify that statement, we must, of course, define what is meant by information and my favourite, and one that supports the previous statement is that information is any modulated signal (i.e., one varying in amplitude, frequency, pitch, etc.).

Let me explain: consider the event frequently seen in hospital dramas on TV: the patient lies in a bed with a monitoring device hooked up to him and on the screen of the monitor we can see wavy lines indicating temperature, heartbeat and other parameters. All of this is information to the nurses and doctors who attend the patient but, suddenly, the signals disappear. The patient is said to have 'flatlined' - there is no longer any modulation carrying information in the signals from the patient, such as pulse rate, because the patient has died. Generally, we see that, as a result, another signal is generated, alerting the nursing staff to the situation.

Or consider the light from the stars, captured by the astronomer's telescope, recorded and analysed to reveal the star's chemical composition. This light, too, is a modulated signal, carrying data that the astronomer is able to transform into information.
When we receive information orally from another person, we are receiving a modulated signal in the form of the other person's speech and, assuming that we both speak the same language, we are able to decode the signal and understand what is said. Words on a printed

page, or on a screen, reach our eyes as modulated signals and, again, must be decoded by the brain, so that the meaning of the words is recognized and understood.

Man as an information animal

The implication of our definition is that everything that is perceived by our senses is information. Consequently, at no time in our evolution have we been without information. When one stone-age, axe-head maker told his apprentice how the flint should be chipped, and demonstrated the actions, he was conveying information. When a prospecting party came back from the hunt with news of the movement of prey, they conveyed that information to the group. And when mothers taught their children which berries were edible and which were dangerous, they were conveying information about the environment that was essential for survival. The children and their descendants would continue to transmit the same information, for as long as the environment in which they survived held the same hazards.

We talk today of the *information society* and yet all human societies since the emergence of *Homo sapiens* have been information societies. Indeed it now seems that our earlier cousin, *Homo sapiens neanderthalensis,* was also sufficiently advanced to possess language and, hence, communicate (Alper, 2003). Organization, planned action, and story-telling are all dependent upon the ability to communicate and, in communicating, we transfer information. Logically, therefore, all societies are information societies and all organization is information-based.

The rise of recorded information

For centuries, oral communication was the only means whereby information could be transferred. Indeed, the oral tradition persists in some societies today. Such societies used to be called, in a rather denigrating way, *primitive societies*, but, of course, for **any** society to evolve and survive, it must have extremely sophisticated ways of dealing with the environment and ensuring survival.

But oral communication alone is hazardous for societies: what happens if a key member dies without conveying what they know to a successor? Unless other members of the society can piece together what they know, to reconstruct what the key member knew, that knowledge will be lost. As Peter Drucker has said, "*Knowledge is between two ears, and only between two ears*" (reported by Kontzer, 2001) and when the head with the ears has gone, the knowledge has gone.

Of course, if the information *has* been transferred to others, and continues to be transferred, through song and story-telling, for example, it may persist for centuries. A recent example of this concerns the verification that a 10,000-year-old skeleton found in a cave in Nevada is an ancestor of members of the present Fallon Paiute-Shoshone people (Devlin, 2018). A representative of the tribe said:

> *"[It] confirms what we have always known from our oral tradition and other evidence – that the man taken from his final resting place in Spirit Cave is our Native American ancestor."*

As human societies became more settled and more complex, they came to rely on the communication of information and it must have been this increasing complexity of social life that led to the invention of writing.

It seems likely that numbers were invented before any of the writing methods, since counting things is required for many purposes. In about 3,000 BC, however, various forms of writing emerged in the Middle East and in what is now Mexico. Perhaps the best known of these early writing schemes, because it is so widely referred to and because the records exist to the present day, was cuneiform, the ancient Akkadian script (Mesopotamia or the modern Iraq) formed by impressions in clay tablets.

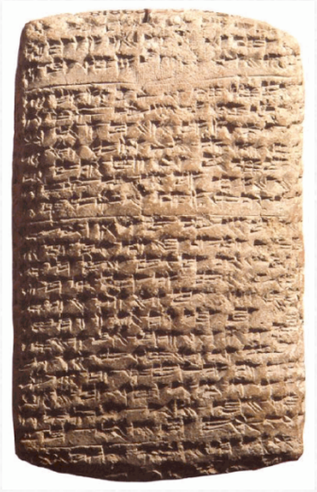


Fig. 1.1. The Armana letter in Akkadian (Public domain image)

As writing developed, so the materials used for records developed: from clay tablets to papyrus rolls, to parchment and to paper, and now, binary electronic representation for display on the screen.

The most significant development, at least until the computer revolution and the World Wide Web, was the re-invention of movable type (the Chinese having invented it previously) by Johannes Gutenberg in 1439, or thereabouts. This allowed the rapid (for the day) printing of multiple copies of works that previously would have needed teams of scribes to accomplish.

With the establishment of the mechanical printing press, the volume of information available to those who could read (a minority of the population) increased enormously. By 1500, sixty years after the invention, there were more than 200 printing houses in Europe and, a couple of decades later, there were perhaps as many as 12,000,000 printed books.

Since the 17th century, the volume of material published has reached enormous proportions with the publication of something in the order of 130,000,000 books. Whereas all members of the Royal Society in 1665 could keep abreast of all developments in science, today's scientist has difficulty in keeping up with everything that happens in his or her own little sub-discipline.

Today, it is not only printed documents that carry information: we have many more media of communication from radio signals, through TV signals, to photographs, moving films, and recordings of all of these, along with recorded real-time data from the operations of a company production line. And, of course, we now have digital representations of all of these media.

As the volume of documented information has increased, the spread of education in all societies has vastly increased the number of people capable of reading and with that growth has come an increase in the demand for information for all kinds of purposes.

Information may also be said to be *embodied*, that is expressed through bodily movement, gesture, facial expression and actual physical features, developed over time. It is obvious, for example, that the condition of a person's body conveys information to the physician, who can 'read' the body in ways not accessible to the untrained layperson. However, even the layperson is able to associate the term

‘homeless person’ to the body sleeping in a shop doorway. We all express aspects of our life experience through the way we use our bodies, deliberately or unknowingly.

The skills we acquire are also expressed through the body, whether it is, for example, touch typing, or through some martial art (see Olsson and Hansson, 2019). Indeed, it may seem that the body itself has, in some sense, acquired the knowledge of how to perform. As a touch-typist, when I type, it seems that my fingers ‘know’ how to move to hit particular keys and I never have to look at the keyboard. Indeed, if one hand is out of action for any reason, I *then* need to look at the keyboard to locate keys I am hitting with the ‘wrong’ hand. However, more than a thousand years ago, the close relationship between mind and body was understood: in about AD 1200 the t’ai chi Master, Chang San-feng, commented

> *In all of this* [i.e., the t’ai chi movements]*, you must emphasize the use of the mind in controlling your movements, rather than the mere use of external muscles.* (T’ai chi classics, 2000)

Neuroscience research (Soon, et al., 2008) has also shown that the relevant area of the brain shows activity up to ten seconds before a decision to press a button is reported. This suggests that, whatever our perception of what is going on, the mind is controlling action, and actions, however intensely they may be learnt, are always governed by the mind.

One can see that the idea of embodied information may have implications for how particular professionals carry out their work: the health professional has already been mentioned and one can readily understand that teachers and social workers may find the concept useful in their interaction with, respectively, students and clients. How far the idea can be employed in the design and development of information systems, however, is rather more problematic.

Relating to information

All of these developments mean that how we relate to information has changed significantly over time. In the oral society, word of mouth was the only way to acquire and convey information and before the invention of the mechanical printing press, the only ways to acquire, say, a papyrus roll or a parchment volume, would be to buy it from its present owner, have it copied by a competent scribe, or travel to read it in a private or monastic library. In the Middle Ages, scholar monks travelled all over Europe seeking the volumes they needed for their work.

As the number of literate people in any society in the 15th century was very limited, the printed book would have been read aloud to groups of listeners, in much the same way as in the oral tradition. For the vast majority of people, a need to know something would involve finding someone to talk to, rather than buying a book or visiting a library. Even in societies with low literacy levels today, news may be conveyed by a literate person reading the newspaper to others in the coffee shop or the bar.

Historians today still travel to locate manuscript sources or public records of the past and when I was researching the information behaviour of academic staff in the early 1970s, I even found one lecturer who travelled regularly from Sheffield to Oxford, to consult a text in the Bodleian Library. I subsequently discovered that Sheffield University Library had a copy of the book, but the lecturer had first

seen it in Oxford and simply assumed that her local library would not have a copy! Perhaps, also, her embodied experience of the book had other associations that drew her to Oxford - the city itself, the Bodleian Library, its reading room and its lighting, everything entangled with the experience of reading it there.

The arrival of the postal system made travel redundant, except for those resources, such as manuscripts and rare books, that could not be lent, and inter-library lending boomed in the era following the Second World War. That era is now coming to a close, with the ability to digitise materials and allow wider access. However, before the development of the Internet and the World Wide Web, how we found and accessed information was very different from today. The researcher no longer needs to make the weekly visit to the university library, to scan the latest issues of journals, and, at the appropriate point of the research process, make longer visits to pore through the abstracting journals, identify likely papers and then locate them either in the same library or request them through inter-library loan.

Note-taking and reference recording on cards were also the standard means of extracting information from documents and recording bibliographical references. Today, with the ease of cutting and pasting paragraphs from electronic documents into a word processor or a database file, these earlier practices appear positively antique.

These brief examples illustrate how the medium upon which information is recorded, and how copies of a work are made available, determine how and where the information may be made accessible. From a time when the scholar monk had to travel from, say, Canterbury to Cluny to consult the sole copy of a Greek text, to the present, when much of what we need is delivered electronically to our 'desktop', the changes have been enormous.

Tell me about it

It should not be imagined, however, that the formalisation of information in documentary form (in which I include all media, including film and sound recording) has buried the oral transfer of information: we do still talk to one another!

Much of our conversation at work is about work-related matters, we convey information about how things are done by word of mouth; we ask questions, we provide answers. Even the modern apprenticeship in industry still relies on the transfer of information orally, even though formal education is now part of the process.

It is the same in our social life: we are not hermits; we communicate with friends and family, with casual associates, with those who serve us in shops and restaurants and, often, we seek information from, or give information to, these contacts.

As we are social animals, the oral communication of information is hardly likely to be totally superseded by 'documentary' media.

What's next?

The aim of this book is to introduce the beginning researcher to the idea of *information behaviour* and to theories, models and research methods that have been found appropriate in the study of the field. In Chapter 2 we shall look more closely at the idea of information behaviour and in Chapter 3, move on to the idea of modelling behaviour. Chapter 4 continues this with the development of a general

model of information behaviour. Chapter 5 deals with the relationships between models and theories, and presents a general theory of information behaviour, while Chapter 6 outlines the range of methods available for carrying out research into information behaviour. Chapter 7 discusses how information behaviour research is used, and Chapter 8 concludes the text with thoughts on the future of information behaviour research.

Think about it

1. How good are your own information seeking skills? You'll notice that no sources are indicated for some of the facts reported in this Chapter, nor for the image. So, where do they come from? There is probably more than one source for each!
2. When did Peter Drucker say, "Knowledge is between two ears ..."?
3. Where did the information on the invention of writing come from?
4. Who says that the Chinese invented movable type?
5. Where did I find the estimate for the number of printed books in existence? (i.e., c. 130,000,000)
6. Who was Laurens Janzoon Coster and why might he be credited with the invention of movable type?

Information behaviour

2

Here we explore what is meant by *information behaviour* and discuss its diversity and complexity and how it is affected by a wide range of factors.

Information behaviour

Outline

Behaviour

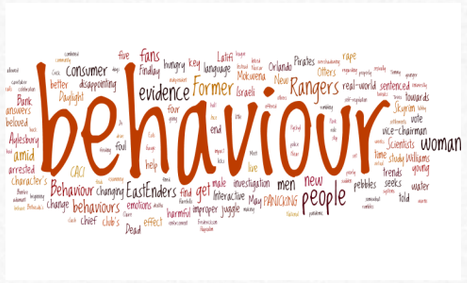


Fig 2.1 Wordle distribution from two search pages

What do we mean when we use the word *behaviour*? We know from being a child about *good* behaviour and *bad* behaviour - the well-behaved child is rewarded and the badly behaved is punished. We see the word being used often enough in the news media: here are some examples from one day's search on the word (and its US variant *behavior*), using Google's news search:

Dalglish praises behaviour of fans [a football story]

Dog Behavior Modification [headline on a pet site]

Drunken riverside behaviour causes concern [of course it was not the riverside that was drunk!]

Gavaskar slams Kohli's 'kiddish' behaviour [a cricket story from India]

Genes, Criminal Behavior Linked In University Of Texas Study

Do a search yourself and you will see how often the word occurs and in what contexts. But what does it mean? Quite simply it means how we act in the world, or, as the Oxford English Dictionary puts it:

a. Manner of conducting oneself in the external relations of life; demeanour, deportment, bearing, manners.

Behaviour, behavioural and behaviourism

A certain amount of confusion has arisen over the use of these terms. It is held that, if we use the word *behaviour* to identify the activities in which people engage, our theoretical approach must be from the perspective of *behaviourism* (Savolainen, 2008). Behaviourism is a psychological theory of behaviour based on the idea that the way we act is conditioned by our interaction with the environment and that we can understand human behaviour without considering a person's mental states.

We can contrast this with *personality theory*, which holds that human behaviour is conditioned by the innate characteristics of the person. In other words, the opposite point of view. Both are theories of behaviour, but I doubt that any psychologist would argue that if I use the word *behaviour* I am implying that I adhere to *behaviourism*. Perhaps the confusion has something to do with the fact that *behaviourism* is also referred to as *behavioural psychology.* However, *behavioural* is also used much more widely, so that, for example, we talk about the *behavioural sciences*, meaning those social sciences that deal with aspects of human behaviour. The Merriam-Webster dictionary defines it quite succinctly:

> *a branch of science (such as psychology, sociology, or anthropology) that deals primarily with human action and often seeks to generalize about human behavior in society* (Behavioral science, 2018)

and the Encyclopedia Britannica is a little more inclusive:

> *any of various disciplines dealing with the subject of human actions, usually including the fields of sociology, social and cultural anthropology, psychology, and behavioral aspects of biology, economics, geography, law, psychiatry, and political science.* (Behavioral science, 2018).

My own perspective on research in the area is not behaviourist but it is *behavioural,* that is, I would hold that human behaviour is determined by a complex of factors, some of which are innately personal, others can be labelled demographic, e.g., educational level, occupation, income, etc., and others are found in the social groups to which a person belongs, such as family, work group, and friendship group, and in the society at large. The examples in the *Types of information behaviour* section will illustrate this point.

Constituents of behaviour

In order to have a coherent language in which to describe behaviour, we need to consider what we should call the elements that constitute behaviour. An unfortunate tendency has developed of referring to information *behaviours,* which can only lead to confusion, since the inference is that behaviour is composed of behaviours, a rather nonsensical notion in terms of rigorous analysis. It is difficult to understand how this may have arisen, since for at least two hundred years of its history in the English language, the word *behaviour* has been used as a mass noun, i.e., possessing no plural.

Fortunately, activity theory offers a way out of the problem by dividing activity into actions, which may be divided into operations (Wilson, 2006). Thus, a Web search using Google (an action) may

involve the operations of entering a search term on the keyboard, moving a mouse to select a listed item, and clicking on that item to bring it on screen - to refer to these operations as *behaviours* is obviously less than helpful.

Information behaviour

Clearly, when we use this combination of words, we are not implying that it is information that is behaving, any more than the journalist imagined that the riverside was drunk (as in the example above). Rather, it is a shortened form of *the behaviour of humans in relation to information*. It denotes how we act towards information, how we seek it or discover it, how we use it, how we exchange it with others, how we may choose to ignore it, and, by extension, how we learn from it and act upon it.

The term is not without its critics, but has become generally accepted not only in information science, but also in other disciplines such as consumer studies, education, health care and business management, although the term *human information behaviour* is sometimes preferred.

I have previously (Wilson, 2000) defined information behaviour as human interaction with all sources and channels of information, and the interaction as active and passive. Thus, information behaviour includes communication with others (orally or written), use of any kind of information resource, and the passive reception of information, such as watching TV advertisements, or reading unsolicited e-mail messages.

The definition is deliberately wide in scope, covering everything from when a child asks, “Daddy why the sky is blue?” to how a researcher discovers relevant facts in the literature of his or her field. It covers how people use formal information systems, such as libraries, but also how they discover information in other venues, such as banks, estate agencies (real estate in the US), tourist information centres, and so on. As the definition states, it covers face-to-face, interpersonal communication, and how one takes notes at a meeting or a lecture. It covers information discovery on foot, by phone and by using a computer. Any means whereby we discover what we want to know (or, perhaps, what we would rather *not* know, and, indeed, how we may choose to avoid it), is *information behaviour.*

Types of information behaviour

I have suggested earlier that our interaction with information is determined by a number of things: the medium in which the information is presented, for example. Thus, if the information we want consists of descriptions of apartments for sale, we either need to buy a newspaper that features advertisements of such properties, or visit an estate agent, or consult www.sanfranciscocondomania.com if we are looking for one in San Francisco or shbarcelona.com if we want one in Barcelona, or you might choose craigslist if you are looking for an apartment almost anywhere. Indeed, we might deal successively with all of these and the precise trajectory of our apartment-seeking activity will depend on whether the owner is acting directly to sell or let the apartment or leaving it in the hands of an agent.

Here three different modes of behaviour may be involved: buying a paper document and scanning the ads, carrying on a face-to-face conversation while viewing paper (or on-screen) details (in the

estate agent's office), and directly interrogating a Website. In all three modes we may carry on another activity; that of recording pertinent things about different properties on paper or, although the convenience is less, on a mobile phone or tablet computer screen.

It is also always possible that, having collected information about the various possibilities, we sit down at our personal computer and construct a spreadsheet in which to enter the data, so that we can more easily compare the apartments on offer against the criteria we have in mind. This is yet another information activity.

Which of these activities a person engages in will be determined by such factors as the person's knowledge of online sources of information, their income level, which might determine whether or not they possess a personal computer, and the nature of their education, which may determine whether or not they can use a spreadsheet, or by the conversations they have had with friends, family and colleagues about the process.

For a student undertaking background research for a term paper, the activities involved are likely to be rather different. To begin with, the motivation is different; satisfying the course requirements. Secondly, the available information resources are likely to be more concentrated. Today that concentration is likely to appear on the computer screen as the student gains access to electronic journals and e-books through university library Websites. Thirdly, the time pressure is likely to be more acute, since students generally leave work on a paper to the last minute, while the search for a new apartment may be less pressing.

So the student may first put an enquiry into Google Scholar to locate possible sources, then identify the most likely journal papers and books and look for them either openly-available on the Web or in the library's resources. Having found material to view on screen s/he may then scan some to determine whether reading the entire paper or a book chapter will be useful and possibly print out a number of papers, or just individual pages. If the student is particularly competent s/he will make a note of the bibliographical references for citation in the paper.

Having engaged in these *information seeking* activities, the student will then begin to extract information from the papers, making notes as s/he goes along. Finally, the paper will be prepared, with bibliographical references incorporated and submitted.

Of course, the whole process may be more iterative than this. A student may begin by outlining the paper and then writing some of the text. A search for supporting literature may then happen, as above, and the writing will continue, bringing in additional relevant material. This thinking, writing, searching, reviewing, using, thinking, writing, etc., process may go on until the paper is complete. A stage of 'polishing' may take place before the paper is finally submitted.

This latter scenario demonstrates that for some tasks, perhaps for many kinds of tasks, there is no particularly neat sequence of stages of behaviour, with different activities occurring at different stages but, rather, a complex interaction of task and information behaviour in an iterative process.

We must also note that the educational institution serving the students must be able to make the relevant resources available: in a poor, third-world country, for example, that might be a problem. Actual resources in the form of books may be limited, and access to

databases might be non-existent. Consequently, the students' actions in seeking information will be determined by what is available.

Finally, consider a women who has just been diagnosed as likely to have breast cancer. What is she likely to do, once the shock of hearing the news has receded? Information exchange with the health professional is likely to have taken place during the diagnostic examination and when she was given news of the results. In such circumstances, however, people may not remember everything they have been told. It is common for hospitals and clinics to have leaflets on the subject, outlining the possible progress of the disease, the prognosis for successful treatment, modes of treatment and so on and such leaflets may have been given to this person.

It is probable, however, that having been given the news and having absorbed it and dealt with it psychologically, the woman will seek advice from other women, particularly those she knows to have undergone treatment for the same disease. She may join a support group, run by the hospital, at which sufferers exchange information about the progress of the disease and the effect of different treatments and how to cope with them. She may also join an online discussion and support group such as community.breastcancer.org or pink-link.org.

The information activities engaged in here are, as you see, mainly a matter of *communication,* both oral and online. There may be additional activities involving searching for additional information and this probably depends upon the extent to which the woman feels that she needs to know more than can be gained by the means she has employed to this point. For example, she may wish to know more about the nature of chemotherapy and its likely effects and how to deal with them and she may be more inclined to do this by searching for information online, or by visiting a library or a bookseller to locate books on the subject. She may come across Dr. Terry Priestman's *Coping with chemotherapy* on the Amazon site and decide to buy it. Having read it and found it useful, she may lend it to someone in her hospital support group; information exchange takes place.

Again, various factors will determine how the woman *actually* behaves. The possibility of joining online discussion groups will not exist if she does not have access to a computer and the Internet, and her ability to understand what she is being told about the disease may depend upon her level of education or her state of anxiety and fear in being informed of the problem.

In looking at only three scenarios in very different contexts we can see that the related behaviour has some common elements but also lots of differences. For some people, in some situations, oral communication of information is desirable; for others, accessing print resources is more usual; for others, a combination of the two is most appropriate.

We also have to bear in mind, particularly for the cancer case, that the response of the person may be to reject information, to fail to seek additional information and simply to ignore the problem, perhaps because of a fear about what the information may reveal. Thus, the rejection or avoidance of information and the failure to respond to a situation by seeking additional information are other modes of behaviour related to information.

Collaboration

A further complication is introduced by the notion of collaborative information seeking. Collaboration may occur in all kinds of contexts; for example, in searching for a new home, one partner may search Internet sites while the other visits local estate agents. Or, in a research team, each member might search those sources with which they are most familiar, pooling their findings in team meetings. Wilson (2004) noted that researchers frequently used '*we*' when describing how they had previously searched for information, signifying that others had been involved in the process.

Collaborative information seeking also implies information sharing: there is no point in sharing the task of discovering relevant information unless the participants share the information with one another. Foley and Smeaton (2010) reached this conclusion, noting that two concepts were involved in the collaborative process: division of labour, and sharing of knowledge.

The consequence of this is that, when we come to try to *model* interaction with information (Chapter 3) we necessarily simplify the behaviour: to model *all* possible variations in behaviour would make our models extremely complicated.

Information need

The notion of information need is dealt with in the next chapter in terms of modelling information behaviour, and it is dealt with here to put it in the context of behaviour in general.

It is fairly evident that some underlying cause must prompt animal (including the human animal) behaviour of any kind. Birds, for example, do not preen themselves purely for pleasure, although they may derive something that we humans think of as pleasure in the process. They preen to keep their feathers clean, free from parasites and in good order. Failure to preen would affect their effectiveness in flying, and, in the mating game, a dishevelled bird would not be likely to attract a mate. In other words, preening is part of the bird's survival strategy, not only for itself, but also for its genes.

Does the bird *think* about what it is doing? You may think not, but birds possess a brain part called the pallium, which appears to perform similar functions to those of the cerebral cortex in man (and other mammals), so to be 'bird-brained' is not to be 'unthinking' (Emery, 2016).

Clearly, some set of motivations drives our behaviour. These motivations may be thought of as instinctual, as in the case of bird preening, or we may be conscious of them. Evolutionary psychology, however, has come up with a theory of the modular construction of the mind, suggesting that, over time, we have developed neurological *modules* (we might prefer to think of these as *networks*, the mind being a network of networks), which support our efforts for evolutionary survival (Kenrick and Griskevicius, 2013).

Kenrick and Griskevicius propose that there are seven such modules (or, as they say, *sub-selves*), which are related to the challenges humans have faced in the course of their evolution. These challenges are: '*(1) evading physical harm, (2) avoiding disease, (3) making friends, (4) gaining status, (5) attracting a mate, (6) keeping that mate, and (7) caring for family.'* The authors suggest that, over evolutionary time, the brain has evolved 'programs' for dealing with these challenges, which they call *modules*.

We should note that these are not the *only* modules, or functional networks, proposed by evolutionary psychologists and others, but simply, those modules that support evolutionary survival. For example, a *theory of mind* module has been proposed, which '*allows one to attribute thoughts, desires, and intentions to others, to predict or explain their actions, and to posit their intentions*' (Theory of mind, 2017).

It is also apparent that, if this modular theory of mind is correct, there must also be modules that deal with things such as face recognition, speech, and the various motor functions of the body.

However, for the purposes of this section of text, we can posit a relationship between the seven 'evolutionary' modules and information behaviour. For example, *gaining status* may involve us in looking for a better job, and scanning the jobs vacant pages of the newspaper, or subscribing to relevant Websites, may be carried out to help us find that better job. Similarly, *avoiding disease,* may result in us not only visiting the doctor for a yellow fever vaccination before travelling to a tropical country, but we may first have read that such a vaccination is necessary on a travel advisory site, and we may subsequently follow up by searching for information on which parts of the country we are visiting have endemic yellow fever.

Evolutionary psychology suggests that the flow of information is two-way, noting that a particular module is activated by the social situation in which one finds oneself. It is information from that social situation that activates the relevant module.

These ideas from evolutionary psychology are not without their critics, and we should not imagine that they are generally accepted. However, for our purpose, they do offer an interesting approach to the motivations that underlie our behaviour.

These ideas, together with the concept of *social framing* (the means by which we contextualise information) and Taylor's (1962) four-level model of needs, have been developed by Cole (2012) into what is probably the most advanced theory of information needs.

Communication

There is a final line to be drawn, if it can be drawn at all, between *communication* and *information behaviour*, since the oral *communication* of information is common and research in a number of areas has shown that finding out from others is a common starting point for discovering information.

Even when we examine how someone identifies and acquires useful information from journal papers, we have to remember that the aim of the journal is to act as a channel of *scholarly communication.* In this situation and in many more, the information seeker is accessing information that others are deliberately seeking to *communicate.*

Perhaps, ultimately, we do not need to separate the concepts, since, in reality, they are so closely intertwined, but one consequence of understanding the connection is that in looking for background information on a research problem in information behaviour, it will be necessary to discover what is being said about that problem in the literature of communication studies. In fact, because of the contextualised nature of information behaviour, it is necessary for any background search to be multidisciplinary.

We can illustrate this readily by referring to the final scenario above and searching Google Scholar for information on `cancer`

`"information seeking".` The first page of results (in June, 2020) has entries from the following journals:

British Medical Journal
Health Communication
Human Communication Research
Journal of Cancer Education
Journal of General Internal Medicine
Journal of Health Communication
Oncology Nursing Forum
Patient Education and Counseling

and none from information science.

Think about it

1. Keep a diary for one day and record all instances of activities that you would define as information behaviour. How many such activities were there? What kinds of activities did you engage in? Which were successful? Were some more successful than others? Can you identify a *mental module* to which the information may relate??
2. Imagine that you are going to buy a bicycle, scooter, or car. What kind of information activities will you engage in to get the necessary information to enable you to decide what to buy and where to buy it.
3. You are about to embark on your chosen research project in information behaviour and your starting point is to carry out a search using Google Scholar. Choose one of the following topics, or make up your own:
    a. Information seeking by TV journalists.
    b. What information behaviour do teachers engage in when undertaking the preparation of a new course?
    c. Information behaviour of software design engineers.

How multidisciplinary are the results of your search? If you re-run the search using Scopus or Web of Knowledge, what differences are there in the sources revealed?

Modelling behaviour

3

Models are widely used in information behaviour research. Here we look at how we develop and use models.

Modelling behaviour

Outline

What is a model?

The word *model* is quite a familiar one, with a number of meanings: the model found most often in the newspapers is the fashion model - a human being who acts as a frame for the display of clothes. Here *model* is used to imply something *ideal*: the model has the perfect shape to display what the couturier intends in the design of the clothes.

We play with models as children: model railways, model boats, model aircraft, dolls, rocking horses, dolls' houses, and so on. Here the model is intended to *represent* something equivalent in the real world, generally in a miniature form.

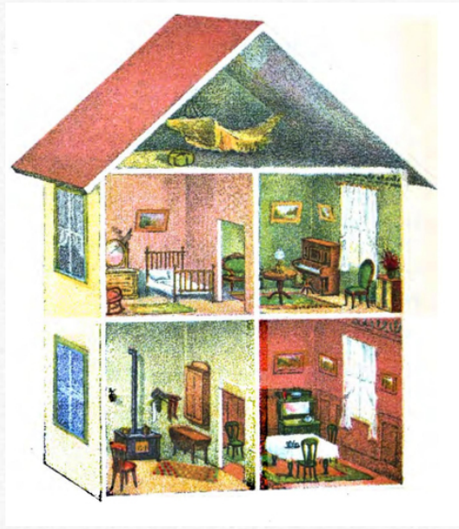
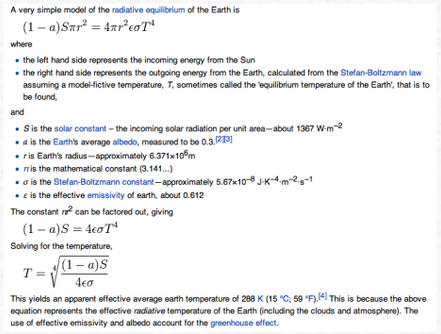


Fig. 3.1 A doll's house (Public domain image)

In the worlds of architecture and design a *model* is a three-dimensional scale model of a building or other intended structure or design object. Here the model is intended to show the client what the building will look like.

We also have *mathematical* models, sets of equations that define the interaction of elements of some phenomenon of interest to us; the picture here shows an extract from a Wikipedia article describing a model of one contribution to a more general model of the earth's climate.



A very simple model of the radiative equilibrium of the Earth is

$$(1-a)S\pi r^2 = 4\pi r^2 \epsilon\sigma T^4$$

where

- the left hand side represents the incoming energy from the Sun
- the right hand side represents the outgoing energy from the Earth, calculated from the Stefan-Boltzmann law assuming a model-fictive temperature, *T*, sometimes called the 'equilibrium temperature of the Earth', that is to be found,

and

- *S* is the solar constant – the incoming solar radiation per unit area—about 1367 W·m^{-2}
- *a* is the Earth's average albedo, measured to be 0.3.[2][3]
- *r* is Earth's radius—approximately 6.371×10^{6}m
- *π* is the mathematical constant (3.141...)
- *σ* is the Stefan-Boltzmann constant—approximately 5.67×10^{-8} J·K^{-4}·m^{-2}·s^{-1}
- *ε* is the effective emissivity of earth, about 0.612

The constant πr^2 can be factored out, giving

$$(1-a)S = 4\epsilon\sigma T^4$$

Solving for the temperature,

$$T = \sqrt[4]{\frac{(1-a)S}{4\epsilon\sigma}}$$

This yields an apparent effective average earth temperature of 288 K (15 °C; 59 °F).[4] This is because the above equation represents the effective *radiative* temperature of the Earth (including the clouds and atmosphere). The use of effective emissivity and albedo account for the greenhouse effect.

Fig. 3.2 Mathematical model of the radiative equilibrium of the earth. (Wikipedia, *Climate model*)

The construction of mathematical models, however, means that we need *measures*. It is quite easy to construct a *pseudo-mathematical* model of information behaviour; for example

$$P_s = N(S) + R + Se/100$$

where, P_s = probability of information seeking; N(S) = perceived need multiplied by intensity of experienced stress; R = Resource availability; and Se = self-efficacy level. That is, the probability of a person engaging in information seeking behaviour is determined by the level of their perceived need for information, the level of stress created by not having that information and the availability of resources, coupled with the individual's belief in their ability to perform the information seeking activity successfully.

All quite plausible, *but we have no measures for any of the variables*. When you see what appear to be mathematical formulations of behaviour the question you need to ask is simply: "*How are these variables measured*?"

Pseudo-mathematical models have their uses, however, in suggesting hypotheses to be tested, as in the case of this example. The Oxford English Dictionary offers thirty-five definitions of model, plus compounds such as *model-maker* and *model agency*, so we could go on at some length to extract more characteristics of models. However, for our purpose, the notion of a model as an abstract representation of some aspect of human behaviour will suffice.

Modelling behaviour

Models of human behaviour abound: there are models of behaviour in general, and models of just about every facet of human behaviour, from learning (such as **Kolb's model of learning styles**) to shopping.

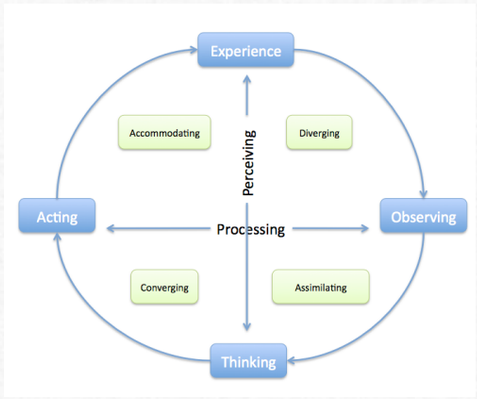


Fig 3.2 Kolb's learning cycle (Based on Kolb (1984).

Some of these models are diagrammatic (and sometimes very simple), others involve complex mathematical modelling. I confess to being somewhat dubious about the latter, since I am generally unconvinced by the attempts to create measures for many of the variables.

Our concern, however, is not with general models of behaviour, but with modelling *information behaviour.*

We must remember, in considering what follows, that any 'box' or node in a diagram is capable of expansion - the object of a model is not to represent the totality of human behaviour of any kind, but to offer a framework for thinking about the problem area. Thus, in Kolb's model of the learning cycle, the box labelled *Acting* is not further elaborated to identify all the possible ways of acting. If the *acts* involved in learning were the subject of our research, that box would form the centre of our further elaborated model.

Another problem with all models is that the connectors between the boxes may be interpreted differently by the author of the model and the reader of the model. For example, two lines leading from one

box to two different boxes may be interpreted by the reader as representing alternative courses of action (i.e., the formulation A or B), but for the author, no such separation may be intended. He or she may intend the formulation (A or B) or (A and B) - that is, the information seeker may engage in activity A or activity B, or in both. However, illustrating this in a model may result in a diagram that is too complicated for the purpose.

Modelling information behaviour

The basic model of information behaviour is extremely simple: in all cases that I can think of, the diagram will represent an information user (or users, collaboratively) in interaction with an information resource or resources.

Fig. 3.3 The basic model

Of course, it quickly becomes more complicated than this, since we have to ask, Why does the person *need* to seek information? What *motivates* them to do so? When are the motivations *strong enough* to enable them to overcome whatever obstacles may lie in their way? Why *this* information resource and not others? And then, What do they *do* when using this particular information resource? How do they navigate the possible approaches to information in the resource? Given that the information resource may be another person, we might also need to ask, What do they need to give in return for the information they get?

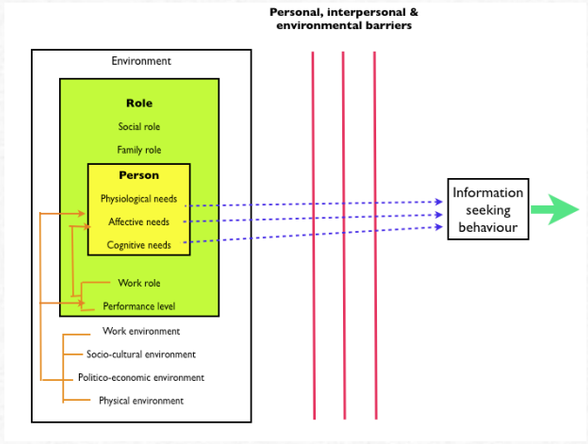


Fig. 3.4 Needs and information seeking

My first attempt at modelling the situation dates back to 1971, when I was running a seminar on the subject at the University of Maryland. The blackboard diagram eventually evolved into Figure 3.4, a version of which was published in 1981. At the time, the idea of *information needs* was dominant and I sought to indicate that such needs would be secondary, arising out of the circumstances of the person's life-world. Even if the person could specify information needs, there would still be a number of barriers to be overcome before he or she would engage in information seeking behaviour.

Thus, the picture begins to grow: in Figure 3.5, I have expanded 3.4 to consider the factors that affect the person in context and that may motivate him or her to consider discovering relevant information.You will see that one node identifies the *activity* engaged in by the person and this node may also be developed further, to identify work-related activities, play-related activities, social role-related activities and so on. In other words we are seeking to define the contexts within which the need to seek information may arise. We can create a further extension to the diagram to illustrate this (Figure 3.6).

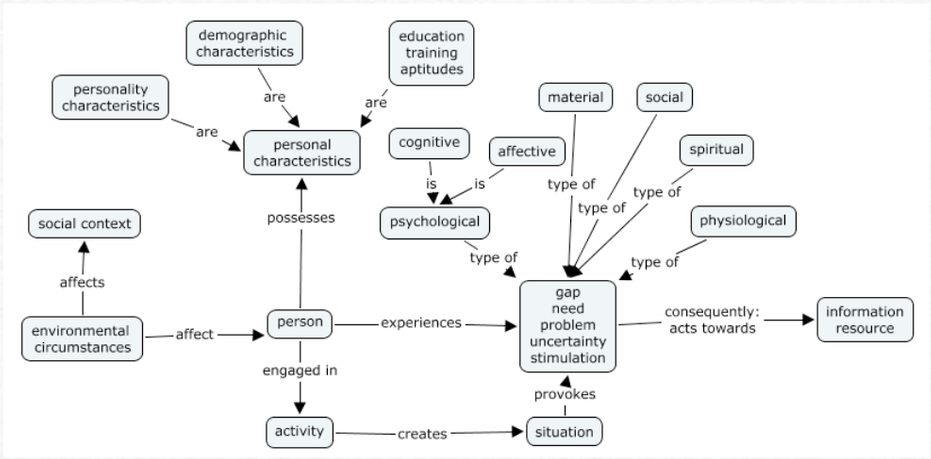


Fig. 3.5 Personal factors affecting information behaviour

The kinds of activities shown are examples and within each activity, e.g., "working", numerous other actions, such as "information sharing", "supervising", mentoring", etc. may be imagined. To try to

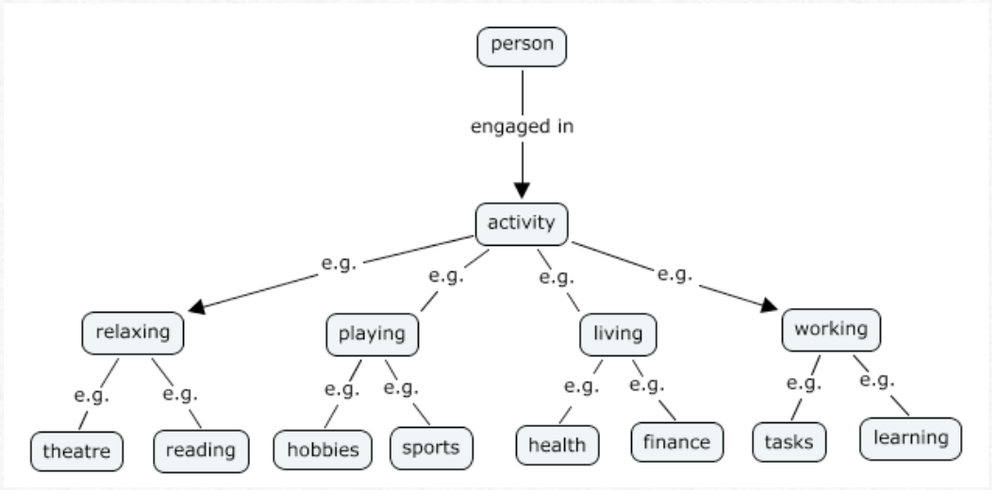


Fig. 3.6 The person engaged in activities

be all-inclusive would be impossible because humanity is always finding new things to do and, also, it would make an impossibly large diagram! This is a point to note about models: they are generic in character and cannot be expected explicitly to define every variable belonging to a particular class. The name of the class stands for all members, past, present and as yet unknown. For example, who would have known in, say, 1980, that Web searching would be a common activity in 2020 (and that it could be done on a phone!)? Now, this activity takes place in a variety of different contexts: it may constitute a work task, it may be something we engage in to find out about an ailment from which we may be suffering, or it may be a form of play or relaxation. Although this could not be made explicit in the 1981 model, that model is sufficiently generic to embrace this activity.

This points to another aspect of the model: specific activities may belong to more than one category of activity. We may exercise for health reasons or simply as part of play; we may do the accounts as a work task, or in looking after family finances; we may read for relaxation or to catch up with the committee papers for tomorrow's meeting.

The analysis of information behaviour requires us to understand the context of the specific information seeking, exchanging and using activities. The information behaviour of the medical specialist in seeking the latest research in oncology, is likely to be different from that of an ordinary citizen seeking information about, say, prostate cancer. The specialist will probably have access to a wide variety of scholarly resources through his or her institution; ordinary citizens will have to discover information resources for themselves.

We shall go a little further in elaborating this model, by focusing on the *information resource*. Before we do so, however, let us look

briefly at the arrow of interaction between the person and the resources. The simplistic analysis implied by the diagram is that the person interacts *directly* with the resource. In the past, this was almost always the case: if you were a scholar monk, wishing to consult a text, you would need to discover where a copy was held, if not in your own monastery, and travel to visit the site. Often, this is still the case today for humanistic research and for access to archives of one kind or another (although many are now being digitised).

Even when direct access was common, however, it was always possible to use an intermediary. Indeed, librarians have been used as such for centuries and, more recently, the original role of the *information scientist* was to serve as an information intermediary for a team of research scientists (Farradane, 1953).

Today, we have both human and machine intermediaries: we can ask someone to find information for us, and informal networks are often used for this purpose, and we can use various alert services to keep us up to date with current developments in whatever is our field of interest.

Even when we carry out a search using any search engine, we are using a machine intermediary, which has been programmed to perform in certain ways, of which most of us are unaware and do not understand. Yet we accept the results as though the search engine had performed precisely to our own instructions. We may have heard of Google's PageRank algorithm, but precisely how it functions may be entirely unknown to us.

I have previously produced a model of the person in interaction with the universe of knowledge, which sets out the complex set of possible interactions (Figure 3.7). The model locates the person in his or her *life world*, signifying the totality of relationships expressed in Figures 3.5 and 3.6. The arrows identify the possible interactions between the person and the universe of knowledge made directly, or indirectly through an intermediary–human or machine.

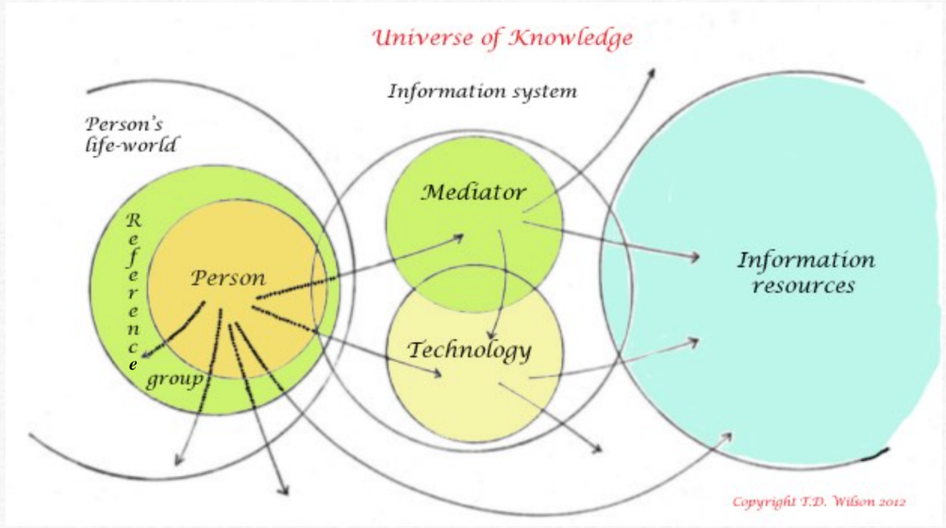


Figure 3.7 The person and the universe of knowledge

Figure 3.7 was developed sometime before the invention of the World Wide Web and the rise of Internet-based resources as the dominant source of information for many people, and yet the model accommodates that development quite happily, since the terms *technology* and *information resources* are generic. In this model, an old-fashioned card catalogue is *technology*; one of the most significant technologies of its time (see Coyle, 2016).

It will not have escaped your notice that Figure 3.7 has been produced in a different way from the other figures in this chapter. It was designed in Microsoft Word® I have used it deliberately to make the point that *how* a model is presented is not particularly important.

The key fact is whether the figure represents effectively an ideal interpretation of what it seeks to portray. Figure 3.8 contains the same elements but, like the other diagrams, has been produced using concept mapping software.

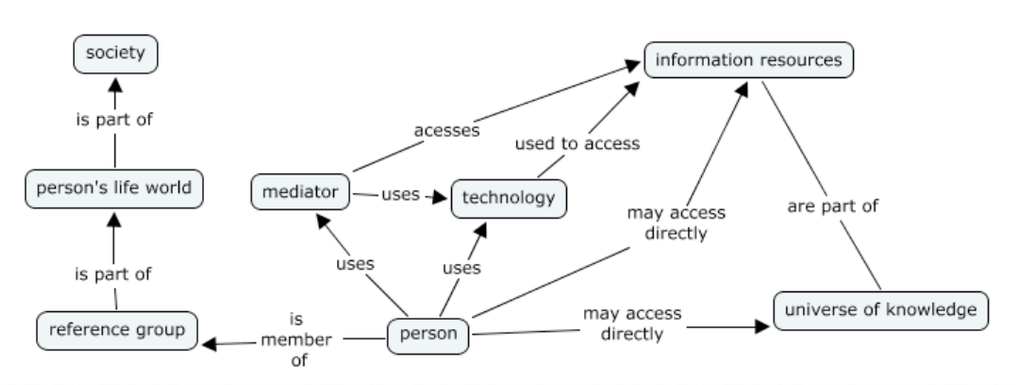


Fig. 3.8 An alternative view of access to resources

You will see from this that the concept mapping enables us to specify relationships among the variables, which could be done using Word® but which would require more effort .

We could complicate Figure 3.7 further by noting that *information resources* may be *personal* (i.e., sitting on my bookshelf or in my computer files), *private* (i.e., requiring membership of an organization (e.g., company or university) for access), and *public* (i.e., generally available to all, either freely as in the case of a public library, or for a charge, as in the case of a newspaper).

Finally, just as information resources can be categorised in this way, so may we identify other constituents of 'the universe of knowledge', the most important of which are other people, whose knowledge we may draw upon to help us solve problems, assist our creative enterprises, or whatever. Some may be personal acquaintances, some may be members of an organization we use, others, such as consultants, may be paid.

Perhaps you have noticed that, to this point, the diagrams contain no *feedback loops*, that is, nothing to tell us what happens when the information is discovered (or not!). Again, I draw upon an earlier formulation to remedy this in Figure 3.9. The diagram has been drawn for this book, but it is essentially the same. In redrawing, I have been able to put in a further feedback line: as I remarked at the time, there's a limit to the number of links you can provide in a diagram before it becomes unreadable!

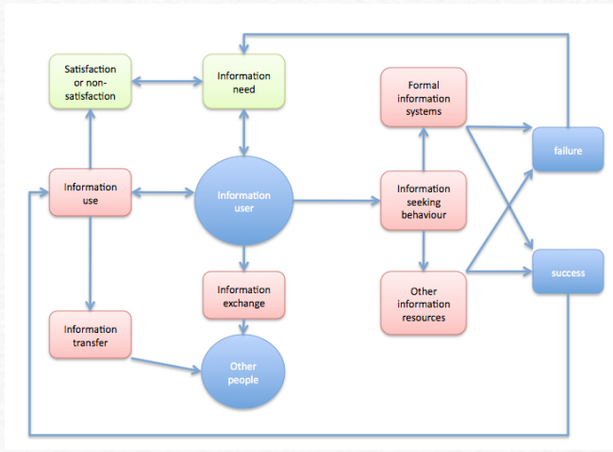


Fig. 3.9 Feedback loops

I think it will be evident by now that, if we were to try to assemble the diagrams in this chapter into a single master diagram, it would be rather complex and would probably require an A1 sheet of paper to accommodate it.

This prompts a further point: rather than trying to model the totality of information behaviour (which, I would argue, would have to include *all* modes of communication, in addition to modes information seeking, acquisition and use) it is probably advisable to concentrate on a single aspect of behaviour. It is equally advisable, however, to have as complete a model as possible in mind, so that if

unexpected factors are discovered, they can be fitted into the overall model.

One way of coping with the complexity of a fully elaborated model and the kind we have been concerned with so far, is to model at a more general level.

The affective dimension

That our behaviour may be affected by our feelings and, in turn, may affect our feelings, is obvious at the extreme. For example, our behaviour when we are angry or fearful is very different from our 'normal' behaviour. It may be expected then, that other, less extreme feelings, may be a reason for searching for information, for example, our anxiety about a surgical operation we are about to undergo, and, equally, the information we discover may moderate that anxiety or increase it.

Indeed, the evolutionary psychologists, discussed earlier, suggest that what activates a particular 'sub-self' or module are feelings regarding the social situations in which we find ourselves. Thus, a feeling of fear regarding some situation will activate the self-protection module and the behaviour appropriate to the situation. Regardless of whether or not we actively search for information in such a circumstance (and time constraints would probably rule that out), it is, of course, *information,* in the sense of all the modulated signals we are receiving, that gives rise to the feeling of fear.

Affect, then, may influence our behaviour at the most fundamental level and it is clear from research in the field, that, for example, in the search process, our affective response to the stages of the search process will vary, from anxiety about our ability to find what we need, through confusion raised by the proliferation of information sources, to relief at finally discovering what we need (see Kuhlthau, 1991).

Information may also *satisfy* affective needs, as we discovered in an investigation into the use of an abstracting service in the field of social welfare (Wilson, 1982). Users of the service were presented with copies of articles they had previously requested from the service and were asked, *Do you recall getting this item? Why did you ask for it?* and *What use did it serve?* Several people responded to the last question in ways that indicated that they were seeking to satisfy an affective need. One had earlier suspected that a member of his staff was anorexic. Clearly, this is a difficult topic for a line-manager to deal with and, eventually, he had talked with one of the doctors who worked with the Department and asked her to take a look at the staff member, informally, and then, if she believed that he was right in his diagnosis, to try to talk with the person more formally. This all took place, the person was given a period of medical leave and eventually returned to work. The line-manager, however, was still worried as to whether or not he had done the right thing. He then found an article through the abstracting service, which dealt with anorexia in the office, and found that he had done exactly what was recommended. His relief, when talking about the episode was palpable.

Other respondents talked about how a document had reassured them in dealing with a problematic social work case, or that it had provided them with background knowledge that helped them to feel more secure in dealing with problems.

We have a situation, then, in which feelings may activate particular modes of behaviour, may be involved in our information

seeking processes relating to that behaviour, and may directly satisfy our affective needs.

Drawing upon a wide range of research in several disciplines, in addition to her own, Nahl (2007) has offered a '*social-biological information technology model of information behavior*', which posits that the affective dimension is central to an understanding of human information behaviour.

It would be unwise, however, to regard *feelings* and *cognition* as completely separate phenomena. Indeed, neurological research demonstrates that the two are intimately connected, and that even such an apparently 'rational' activity, such as making purchasing decisions, may be driven by feelings. For example, Knutson et al. (2007) showed that the activation of parts of the brain associated with feelings of loss or of gain could predict purchasing decisions. In other words,

> *individuals have immediate affective reactions to potential gain and loss, which serve as inputs into decisions about whether or not to purchase a product. (p. 153)*

Conclusion

We can take a break at this point, before moving on to explore the information discovery process in more detail in the next Chapter. So far, we have reviewed the models produced earlier, developing them where it seemed appropriate. We have also considered the affective dimension which can be not only an aspect of the experience of searching to meet some goal, but may also act as a driver, or motivation, for information behaviour of different kinds.

Think about it

1. Are you a verbaliser or a visualiser? You may intuit this from your behaviour, or perhaps you can find an online learning-styles test.
2. At the end of Chapter 2, it was suggested that you keep a diary of your information behaviour. Can you now produce a diagrammatic model of some part of that behaviour?
3. If you kept a diary, could you now identify the feelings you experienced during the different activities?

Information behaviour: a general model

4

The further development towards a general model of information behaviour

Information behaviour: a general model

Outline

A general model of information behaviour

We have seen how easy it is to construct *complex* models of how people behave in relation to information sources and resources. The picture quickly becomes too complex to comprehend easily. With this in mind I produced an alternative model in 1996, which reduced areas of complexity to 'black boxes' and which also introduced theoretical, explanatory concepts to suggest, for example, why a need for information for some purpose does not *always* lead to information seeking.

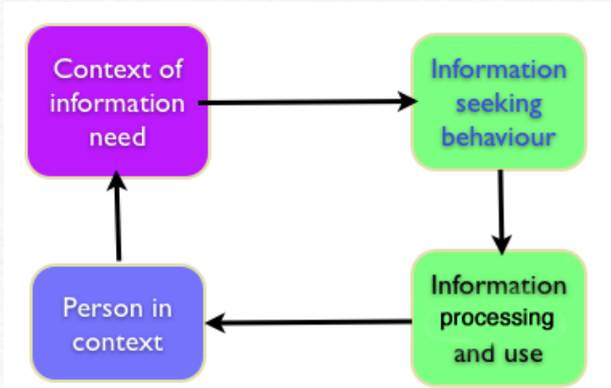


Figure 4.1: The general model

The model can first be shown in outline (Figure 4.1) and its connections to the earlier models explained. You will see that it is very simple, with only four boxes, showing the person in context, and the specific context in which information needs arise. Taken together, these embrace the figures set out in the previous chapter. *Information processing and use,* up to this point, has not been modelled. Like all descriptive models, however, the cycle of states and activities presented here tells us nothing about *why* needs arise, *why* some conditions result in information seeking and others do not, *why* different people under the same conditions do not behave in the same way, and a thousand more *why* questions.

To answer these 'Why?' questions, and even to think of raising them, we need to embed some theoretical ideas into the model. It's obvious that not everyone seeks information in response to experiencing a need. Perhaps, for some, the answer to a problem, or background for a decision, already exists in their own memory and they simply have to recall it. Others may not know that information, or relevant information sources, exist. For others, the effort needed to discover information may be too great.

We can also take a step back and note that some people may not recognise that the problem they are experiencing *has* an information dimension. Being unaware, for example, that public agencies may exist to help persons in need is in itself a barrier to seeking help from such sources.


HUMAN BEHAVIOR
AND
THE PRINCIPLE
OF LEAST EFFORT

Figure 4.2: Zipf's book

The question, then, is: Is there any theoretical proposition that might explain these differences in behaviour?

One possibility is the principle of least effort (Zipf, 1949) which postulates that we take the course of action in a given state of affairs that requires us to do as little as possible. If my working surroundings are a mess, I will tidy things up when I need to find something, but otherwise let the mounds of paper grow. I once worked for a college principal who practised this as a fine art. His desk was covered with mounds of paper apart from a small area that allowed him to sign letters and eat his lunchtime yoghourt. Whenever he needed one of those bits of paper, he sorted through the piles until he found what he wanted and, when he was finished with it, he moved it to another of the piles. Clearly, he believed that this was less time-consuming than trying to file the documents. He might well have been right! The piles had some structure that, presumably, related to the tasks he had to perform as head of the institution. For example, one day I was called to his office to explain my absence the previous day. I told him that I had sent him a memo to say that I would be at a meeting, and he only had to search in one pile to find the memo–possibly the pile contained communications from members of staff.

If the principle of least effort is a fundamental determinant of human behaviour (and much research suggests that it is), we cannot be surprised at the fact that people will first search their surroundings for information or ask nearby colleagues at work, rather than engage in a more time-consuming and potentially frustrating search.

We know, however, that some people in some circumstances do not even bother to seek information from others: they make no attempt at all. What can explain this behaviour?

In that earlier model I suggested stress/coping theory as a possible explanation. This essentially psychological theory, or set of theories, has been used mainly in the health sciences and appears in the health information seeking field as *monitoring* and *blunting*. These are alternative ways of coping with the fact of having a serious disease. *Monitors* cope by discovering everything they can about the disease, while *blunters* reject information, fearing the worst, and not wanting bad news.

In adapting stress/coping theory to information behaviour in general, I am suggesting that if the level of *stress* associated with a problem, or

other situation that can be helped by information, is high, a person may be more likely to seek information. If the stress level is low, the need to seek information may be diminished. By *stress* I do not mean only those high levels of stress associated with health problems, but any feeling of *unease* in a situation. As Krohne says:

Two concepts are central to any psychological stress theory: appraisal, i.e., individuals' evaluation of the significance of what is happening for their well-being, and coping, i.e., individuals' efforts in thought and action to manage specific demands. (Krohne, 2002, *Stress and coping theories*. (Section 1.2, para 1)

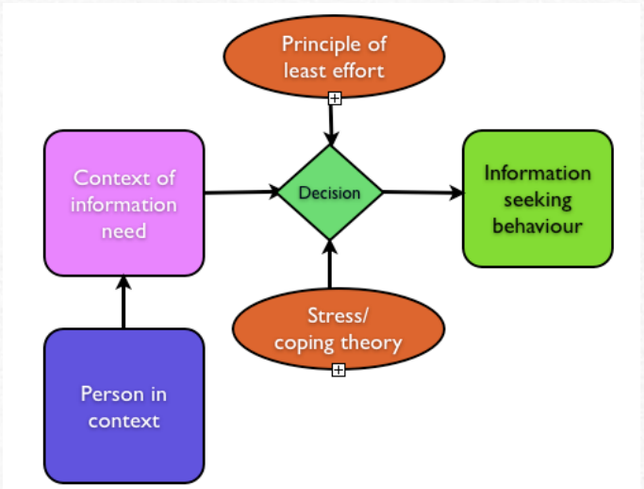


Figure 4.3: The decision point

In addition to well-being we might use the term self-interest, since many situations arise that have the potential to induce stress, but which do not affect one's well-being. For example, it may be in one's interest to be promoted and a person may engage in all kinds of information seeking to try to ensure that they are sufficiently well-informed to cope with the job interview.

We can now add to Figure 4.1, selecting only the first part for amendment. Here we have added the fact that, at some point, the person must make a decision about whether to engage in the collection of information relevant to their current interest.

Note that only one decision is depicted in Figure 4.3, for the sake of simplicity, but the person may decide not to seek information, deliberately to avoid information, or to postpone a search, or to delegate a search. If an intermediary is used, the subsequent courses of action will be different, since the motivation to search differs (it is not the intermediary's problem) and the intermediary may be more or less knowledgeable about information sources and more or less skilled in accessing and acquiring the necessary information. This will apply whether the relevant information is held by a system or by a person.

However, nothing is ever simple! An intention to search for information does not necessarily result in a search; things get in the way. In the earliest model (the basis of Figure 3.4), I described these as *barriers* and noted that they could arise out of the same contextual elements as the needs themselves. Thus, the barriers were *personal, interpersonal* and *environmental*. Given that the person has *physiological, affective* and *cognitive* attributes, it follows that these may also be the source of barriers to action. A physically disabled person, for example, wheelchair bound, is unlikely to be able to access a library if wheelchair access is lacking. Someone who *fears* to reveal his ignorance to a superior, may be reluctant to seek information from that person. If someone lacks sufficient *knowledge* to carry out an effective search for information, he or she may decide not to bother.

In the later extension of that early model these barriers were referred to as *intervening variables*, i.e., factors that intervene between the decision to seek information and the search, and a fourth category was added: *source characteristics*. The term is more appropriate, since *barriers* can only mean some obstacle to

information seeking, whereas intervening variables may either assist or impede the process. Here, I have further distinguished *socio-economic* variables, which I had previously grouped with either role-related or environmental variables. In addition, I have identified *beliefs* and *values* as separate categories of variables. Thus, to Figure 4.3, we can add these intervening variables, to produce Figure 4.4.

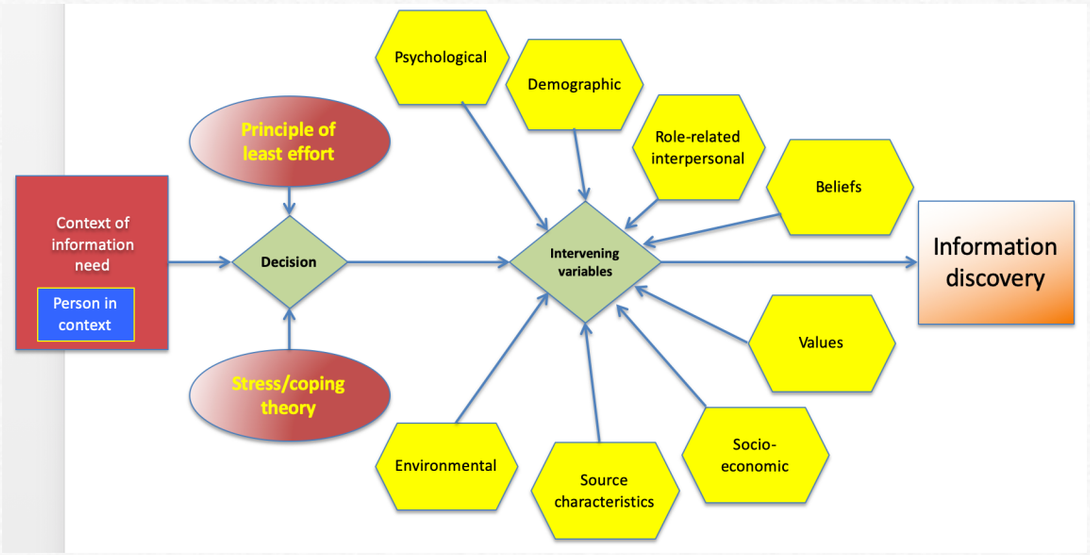


Figure 4.4: Categories of intervening variable

We can enlarge each of the categories shown here to identify the kinds of factors that fall within each group, although to show all possibilities would make for a rather dense diagram. For example, the *demographic* variables will include, age, sex, educational level, ethnicity, employment status, home ownership and more. The psychological variables are those relating to the individual, most commonly those relating to personality. Thus, Heinström (2003) has used the five factor model of personality (neuroticism, extraversion, openness to experience, agreeableness and conscientiousness) and related these to information seeking. The concept of *learning styles* and *individual differences*, has also been explored (see, e.g., Ford et al., 2001; Ford et al., 2002).

Role-related variables, are those related to the individual's social roles: the plural is used because people perform more than one social role. For example, a person may be the father in a family and has a role to play in that position, and, at the same time, captain of his local cricket team and finance director of a company. Each of these roles will put certain demands for information on him: as father, he may need to gather information on local schools in order to select the appropriate one for a child, as captain of the cricket team, he may gather information on an opposition team for use in a forthcoming match, discovering whatever he can about their strengths and weaknesses, and as finance director, he will have numerous work- and task-related information needs. Each of these roles will have different constraints in relation to the information available and the means of access and the person's individual activities may differ widely from one role to another. It will be evident that some roles fall under the heading of everyday-life activities, but the fact that the roles are embodied in one person suggests that it may not be useful to separate such activities as somehow different and disconnected from the other activities. After all, as captain of the cricket team, the finance director may meet colleagues from other companies and may discuss business issues in that situation as well as the weather, which is currently interrupting play!

From the perspective of business and industry, it is the work- and task-related roles that are of most interest to information behaviour research. Task complexity will affect the need for

information, such that routine tasks that are well within the scope of a person's competency, will give rise to few needs for information to support them, whereas complex, non-repetitive tasks are likely to give rise to more need to gather information to help perform them. Role position will also have an impact: the information needs of the sales and marketing director will be different from those of the salesman.

There is overlap, inevitably, between role-related and *socio-economic variables*, since people in different roles will be subject to different socio-economic factors. However, we can distinguish the socio-economic factors as being external to the person, whereas *role* is an attribute of the person. Thus, a person's income level may prevent him or her from seeking information from pay-walled online newspapers, or, if the person is affluent, may enable the activity. Similarly, however we measure social class, those in the higher social classes will probably be more highly educated and more accustomed to seeking information to help them to solve problems; their network of personal contacts or *social capital* may also be richer and better able to provide information when needed. Other social factors may include the social *institutions* provided by the state, such as public libraries. At the present time in the UK we see a decline in such provision and the impact primarily on those for whom the library is the principal source of information, including those without home access to the Internet. We might also include *political* factors within the socio-economic group, since there is likely to be a strong relationship among all of these.

For example, a dictatorship may prevent access to sources of information, whereas a genuine democracy will permit access and encourage free speech. We have seen recently a number of cases of how Western democracies have attempted (and at times succeeded) to prevent access to information that might embarrass the political class. Cory Doctorow's young adult novels, *Little Brother* and *Homeland*, provide a timely reminder (as Orwell's *1984* did earlier) of how power, and fear of the loss of power, corrupts, and when something like *Wikileaks* embarrasses a major power, it may lash out indiscriminately against those who have caused the embarrassment. The cases of Bradley Manning, Edward Snowden and the Saudi journalist Jamal Khashoggi are vivid reminders of this fact.

In using the term *environmental variables*, I refer to the physical environment within which all of us survive, although it is used by some to include what I have called the *socio-economic* variables. We can see, at the extremes, that people are adept at *reading* the physical environment and deriving information from it. For example, if I was placed in the middle of the Amazonian forest, I would be quite unable to survive, unable to tell anything more than the points of the compass (derived from the rising and setting sun) and quite unable to tell which plants were edible and how to defend myself against predators. Native inhabitants of the same forest, however, would obtain a wealth of information from their surroundings. We can also include within the environment the physical infrastructure; thus, roads, railways and telecommunication services aid communication and travel and enable people to reach sources of information readily. In regions with poor infrastructures of this kind, movement is inhibited and people may find it difficult to access the information they need.

Today, the Internet is a significant part of the global information infrastructure, but access to the network varies significantly from country to country, with countries in Africa having the lowest

proportion of inhabitants who can access the Internet (Sample, 2018). This gives rise to what is referred to as "the digital divide", that is, inequalities within and among countries, between those able to access and derive benefit from the Web, and those unable to do so.

The digital divide has become much more obvious as a result of the Covid-19 pandemic in 2020. With doctors' surgeries closed or operating only through telephone communication, and hospitals rescheduling even serious conditions because of the need to deal with the pandemic, more people turn to online sources of health information, such as the National Health Service site in the UK, or WebMD.com and the 'digital health clinic' Roman, in North America. Those without computers or Internet access are then further disadvantaged in this situation. Even for those with access, the situation is risky, since self-diagnosis can lead to the wrong treatment being used.

According to Usó-Doménech and Nescolarde-Selva (2015, p. 147)

> *Belief systems are the stories we tell ourselves to define our personal sense of Reality. Every human being has a belief system that they utilize, and it is through this mechanism that we individually, 'make sense' of the world around us.*

The most common forms of belief system are religious, political, and philosophical, and it is clear that our belief system may shape our approach to information, our judgements of what is valid information in a particular circumstance, and attitude towards misinformation and disinformation. Currently, and mainly in the USA, the belief is held by a minority of the population, under the name of QAnon, *'that a cabal of Satan-worshiping pedophiles is running a global child sex-trafficking ring and plotting against US President Donald Trump, who is battling against the cabal'.* (QAnon, 2020). Those who hold to this belief dismiss contrary evidence and propagate their ideas among the group, and as many converts as they can recruit, mainly through social media sites, particularly Twitter and the message board *8kun* (formerly *8chan*). However, they also hold meetings and turn up at Trump's election events. The rest of the world regards these ideas as nonsense and the evidence put forward as misinformation, but adherents of the conspiracy theory appear to have complete belief in the truth of their allegations.

Another rather extreme belief system is that of those who oppose vaccination. Such opposition originated at the very beginning of this medical advance (Weightman, 2020) and, in effect, reflected the opposition of belief systems: in this case religion versus science. Today, the anti-vaccination movement appears to have come about as a result of misinformation arising out of the work of Andrew Wakefield, which was subsequently found to be fake (McKee, 2004). Again, social media and the Internet in general are used extensively by those holding these beliefs and information, which does not support their beliefs, will be rejected.

Brain research reveals how difficult it is to change people's beliefs; reviewing this research, Sullivan (2019, p. 255), commented '*our brain has a disturbing tendency to only consider evidence that reinforces its current beliefs'.* It appears that when contrary evidence is presented to a person, the sections of the brain that are activated are the amygdala, which is the part that responds to threats, and regions

associated with self-image, suggesting that the person feels that their personal identity is threatened (Kaplan et al., 2016).

Belief systems are closely related to the *values* we hold: we may think of beliefs as being composed of certain sets of values, or of values as arising out our beliefs. Beliefs are our conviction that an idea or proposition is true: values are those aspects of our beliefs that are important to us and guide our behaviour. Thus, if we believe that vaccination is harmful, we will value any report, true or not, that appears to support our conviction. We will *trust* other *anti-vaxxers* who believe what we believe, rather than the medical professionals.

The most comprehensive analysis of values appears to be that of Schwartz (1992). Schwartz proposed (based on earlier work by

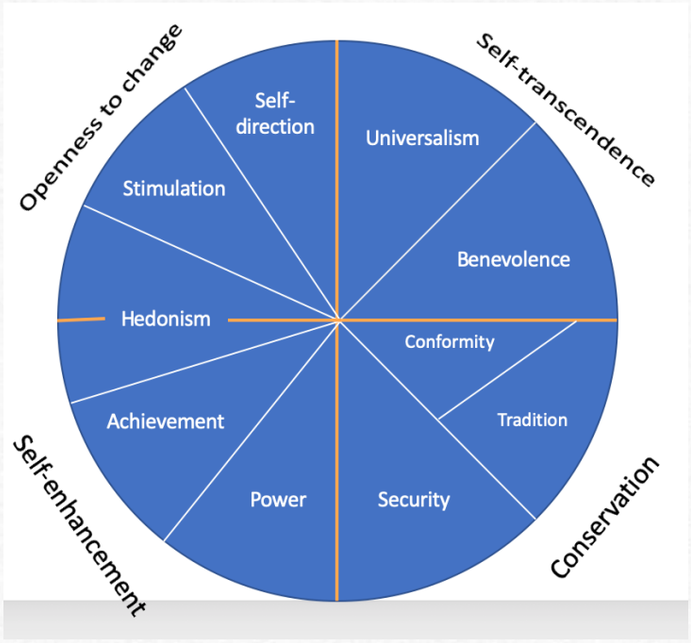


Figure 4.5: Schwartz's theory of human values

Schwartz and Bilsky (1987, 1990) that there were 12 human values, which were related as shown in Figure 4.5:

As the figure indicates, Schwartz suggests that there are four categories of values, relating to self-transcendence, conservation, self-enhancement, and openness to change. Schwartz carried out a study in twenty countries to test this theory, finding that the power, achievement, and tradition values were found in all countries; hedonism, self-direction, universalism, and security were found in nineteen countries; and stimulation, benevolence, and conformity, in eighteen countries (Schwartz, 1990, p, 38).

Schwartz subsequently increased the number of values to nineteen through further analysis of the original ten values (Schwartz et al., 2012) No *new* fundamental value is introduced, rather the existing values are subdivided. For example, *universalism* is split into three types: commitment to equality, justice, and protection for all people, preservation of the natural environment, and acceptance and understanding of those who are different from oneself.

As far as I have been able to determine, Schwartz's typology of human values has not been used in information behaviour research, but the potential to do so is clear. Beliefs and values do occur in information behaviour research, mainly in relation to health information and beliefs about the nature of cancer and its possibility of cure (e.g., Hong and You, 2016; Xie et al., 2020).

Also, another inventory of values, the meta-inventory of human values (Cheng and Fleischmann, 2010) has been used by Koepfler and Fleischmann (2011) in a study of the values expressed in tweets.

Finally, we can consider the characteristics of the anticipated *sources of information* as an intervening variable. This is rather different from the rest, since it is neither an attribute of the person, nor is it a factor *directly* related to the socio-politico-economic

environment in which the person functions. Rather, it relates to the possible *future* action of the person and is based on their existing understanding of the nature of information resources within their sphere of action.

Consider a visually-handicapped person, who may be prevented from accessing certain information resources because of not knowing which sources have capabilities to assist visual handicap. Or, the computer used by that person may not have document reading technology built into it.

A more common case may be that of someone who does not feel comfortable with computers and believes themselves to be incapable of using them to access information. Information sources are of varying degrees of completeness, complexity and reliability and a person may have difficulty in determining this. For purposes of security, some information sources (commercial news sources, for example) may require registration and passwords and this may be a deterrent to someone who does not wish to reveal what they are searching for.

It is easy for information professionals to assume that accessing and using information is a straightforward process, but, for those whose formal information seeking is a relatively rare phenomenon, this may well not be the case.

The information resources *are* subject to the politico-economic factors of society, but the information user experiences the effects *indirectly,* through the media, and may be unaware of the biases introduced by, for example, the ideological position of newspapers, or the other factors that may be influencing a journal editor's choice of papers to publish. What is available *at all* is also subject to ideological and commercial interests.

What prevents the *discovery* of information?

You will see that, in Figure 4.4, I have used the term *information discovery*, rather than *information seeking behaviour*, which was used in the model published in 1996. I do so because, even then, I noted that, in addition to our going after information, information sometimes comes after us!

Before we move on to discuss the discovery of information, however, there is another stage in the overall behaviour. A person may have the initial need for information and the motivation to satisfy that need, and the intervening variables may be supportive of further action, but the person may still not undertake that action.

Why not? I suggest two theories to explain this situation, I called them *motivating mechanisms* in the 1996 model, and perhaps that will serve until we find a better term. The theories are *risk-reward theory* and *social cognitive theory* (also referred to as *social learning theory*).

Risk-reward theory

The basic principle of risk-reward theory is quite straight-forward; it is the notion that, in determining how to act, we review the risks and rewards associated with the action, either on the basis of our previous experience, or on some other basis (for example, exploring a little and

assessing whether or not further action is worthwhile, or drawing upon the experience of others).

If we are sitting in front of our home computer, exploring the resources of the World Wide Web, the associated risks are probably very small: we do not need to pay for services offered, if we do not wish to do so, for example. And the rewards may be high, in the sense that we find the information we are looking for. On the other hand, if we lack a home computer, and the public library is only open during our own working hours, is it worthwhile losing time at work in order to go to the library and either carry out a search there ourselves or ask a librarian for guidance?

In other circumstances there are risks to our self-esteem: for example, if we hold a senior position in an organization, we may feel embarrassed at needing to ask a junior member for guidance in relation to some activity or decision making. Alternatively, if we know that our boss does not "suffer fools gladly" we may be deterred from seeking information or advice from him or her, for fear of being considered such a fool.

Drawing upon the literature (some of which is reviewed in Wilson and Walsh, 1996) we can identify different kinds of risk. *Time* may be an important factor if we lead a busy life and "time is money"; we may not be prepared to spend very much time in trying to discover information, unless the attendant rewards are high. Thus, an investor may be prepared to spend a great deal of time in discovering everything s/he can about a company whose shares appear to be priced below their true market value. On the one hand, s/he wants to make a profit, but the rewards of buying into a failing company would be highly negative!

If "time is money", there is also *financial* risk: we do not wish to invest too much of our finances in an activity that may result in a poor reward. There is little point in spending £100 in order to gain £1. Given the enormous amount of information now available on the Web entirely freely (apart from the cost of our Internet connection and our time) there may be very little financial risk involved in a search for information. In business areas, on the other hand, people are prepared to pay the required subscriptions to the *Wall Street Journal* and the *Financial Times* Websites for the convenience of having financial and business information readily to hand. If a person is relatively affluent s/he will probably pay little attention to trivial expenses in the search for information but the cash-poor are also likely to be information-poor. The full-time trader will also be prepared to pay for the real-time feeds from the stock exchanges, since s/he will probably be making trades on a daily or even minute by minute basis.

Physical risk will rarely be experienced in the discovery of information, unless one is the mythical traveller seeking the advice of the guru on the mountain top. Will the spiritual insights gained be worth the potential loss of life? There may be physical risks in other contexts, however: for example, if the country between our home and the city is patrolled by troops of an insurgency, we may put off travelling and do without the information we would have found in the city, until the situation is resolved. Or, as a *Guardian* article reports, we may actually move away, simply to keep in touch with family and friends (Mumin, 2018).

There is also the risk to one's *ego*: that is, does the risk of loss of self-esteem outweigh the benefits of the information we seek, or does success in the discovery enhance that self-esteem? If the information

enables us to perform some task more effectively, our self-esteem may be enhanced, but if we fail to find information that we know to exist, our self-esteem may suffer a setback.

We are rarely alone in our endeavours - we have a family life, our work, our social life, and so on. So, in addition to self-esteem risks, there may be *social risks*, a loss of esteem among our friends, business associates, etc. This may be particularly the case if we are engaged in some collaborative task or activity and the discovery of information relevant to that task or activity is our responsibility. If we fail in that responsibility, our *social esteem* may suffer.

We might also think of an *energy risk*, where energy may be either physical or intellectual: in other words, how much work do we have to do to obtain the information we need? If the rewards are low, we will not be prepared to spend much energy in the search for information, if the rewards are high, we may be prepared to expend more.

Risk has been associated with information seeking research, mainly in medicine and the health sciences and concerned with risks to health; for example, Saab et al. (2018). Studies from an information science perspective are relatively rare: a search on Web of Science revealed only three papers in information science sources, Blair, O'Connor, Bonnici, Chilton & Aksakal (2004), Choo (2017), and Shakeri, Evangelopoulos, & Zavalina (2018). The paper by Saab et al., referred to above, is in the journal *Psycho-Oncology,* and the authors are all medical researchers.

Social cognitive theory

The notion of *self-efficacy* stems from social cognitive theory, proposed by Albert Bandura in 1982. The idea is quite simple: perceived self-efficacy is a person's belief about whether they are able to engage effectively in some activity. My perceived self-efficacy regarding searching the Internet is quite high and, therefore, I am not likely to be inhibited in deciding to carry out a search. Another person, however, may have low perceived self-efficacy in this regard and may see the task of information searching, using a computer keyboard as beyond their competency.

We can see, therefore, that this notion of self-efficacy may have some power in explaining why the performance of the task of information searching may be seen by some as too problematic even to begin the task. Your personal assessment of your ability to perform a task may either help or hinder the performance.

The concept does not appear to have been used in information science before its inclusion in the 1996 model, and since then there have only been a small number of papers published that use it as a research variable. Most of these papers, according to *Web of Science* have been published since 2000. They include work by Savolainen (2002), which related self-efficacy to *network competence* and in which he comments that:

> *Network competence – as a combination of "knowing that" and "knowing how" (skills) – is contingent upon beliefs of self-efficacy. Particularly in the case of novice users, the way in which existing competence can be used is significantly dependent on how confident the individual is in regard to his or her ability to master*

> *ICTs and to search for relevant information from networked sources. (p. 222)*

More recently, following a review of the literature on *imposed-inquiry information seeking*, Clark (2017), usefully sets out a number of research ideas:

> *There are numerous avenues of future research that should be pursued: how does information seeking self-efficacy change over time? what pedagogical techniques best promote self-efficacy acquisition? how does motivation and other affective characteristic influence self-efficacy level? how does the Dunning-Kruger effect impact self-efficacy and information seeking skill acquisition? how can self-efficacy be assessed more accurately? what other, currently unknown, variables affect information-seeking self-efficacy, and how can they be manipulated to improve student learning? (p. 421)*

From this analysis of the *intervening variables*, it can be recognized that moving from recognition of a need for information to the actual process of discovering the necessary information is not a foregone conclusion. Many factors may intervene and there is a need for research into why people *do not* move on to search for information when the need for that information is evident to them.

Modelling the information discovery process

As noted earlier, I had previously named this box *information seeking behaviour*, but I have decided that *information discovery* is a more appropriate term, because purposive information seeking is only one of the activities through which people discover information.

The model proposed in 1996 suggested that *information seeking* covered a number of activities, namely: passive attention, passive search, active search and ongoing search. In reviewing these, I think we can revisit these terms from the perspective of *discovery*, which may help in developing more elaborated models of the activities.

Passive attention is involved in the discovery of information when attending to some communication source without the *intention* of seeking information to satisfy some need. The most obvious example is when we are watching television when an advertisement happens to deal with a product we are currently interested in buying. We suddenly pay more attention and acquire information that may turn out to be of use to us in making a purchasing decision. We may even make note of a telephone number or the address of a local supplier. To take another example, we may be attending a conference, listening to a speaker on a topic that is of only peripheral interest to our current research and hear mention of related research that is of direct interest. We are likely then to make a note of the work cited and subsequently engage in an active search for the work. Information discovery may arise even at the purely conversational level: person A is talking with person B about finding an electrician to do some work in the house, person B recalls that he suspects that one or more of the electric

outlets in the house is running hot, and take the name of the electrician with a view to contacting him.

Clearly, the notion of *passive attention* bypasses most of the earlier stages in the model. There is an information need, but it is not dominant in consciousness at the time relevant information is received–the information received brings the need into consciousness: the person has not been actively seeking information to satisfy that need at this point. The notion of *serendipitous discovery* or *information encountering* applies here, since the acquisition of relevant information is more or less accidental.

I described *passive search* as seeming to be a contradiction in terms and I now suggest the term *coincident discovery*, that is, the discovery of one thing while searching for another. A not uncommon occurrence, for example, when searching for a book on the library shelves. *Accidental discovery* then becomes the general phenomenon and passive attention and coincident discovery become examples of the phenomenon.

The opposite of accidental discovery may be termed *intentional discovery:* previously I have used the terms, *active search* and *ongoing search.* However, there is room for ambiguity here, since an ongoing search (i.e., the regular repetition of a search for continuous updating, also known as *successive searching*) is also *active.* So, rather than 'active', I shall use *considered*, to indicate a planned search to satisfy an immediate need, and active search is renamed *one-off search.*

The considered search is what happens when we deliberately intend to try to discover something and it is the mode of information discovery to which most attention has been given. It is important to note that we may undertake a considered search ourselves or delegate the search to a human or computer intermediary, and that the search may be one-off, as when we ask a reference librarian to find an answer to our question, or ongoing, as when we use a search profile to set up a Scholar Google Alert, or a publisher's alerting service for the contents of a journal.

To model these activities we would need to have in mind the search environment, which may vary from one's own store of computer files (or books in a personal library), to the shelves of a university library, or the remote files of an online bibliographic database, such as Google Scholar. Modelling at this stage would take the form of mapping the sequence of operations carried out to complete the activity. We can, of course set out a hypothetical sequence of operations such as scanning, selecting, retrieving, evaluating, rejecting or retaining, storing, on an *a priori* basis, but, for various purposes, we may need to record and relate very detailed operations, such as eye movements made in scanning a text on screen to determine which areas should be given attention for effective design

However, there is at least one more mode of information discovery, which, in Figure 4.6, I call keeping informed: it is also referred to as monitoring. Again, this is an intentional mode of information discovery, such as when we subscribe to newspapers, journals and magazines, or to podcasts or YouTube channels. We do this not necessarily to satisfy any immediate information need, but simply to keep abreast of developments in areas of interest

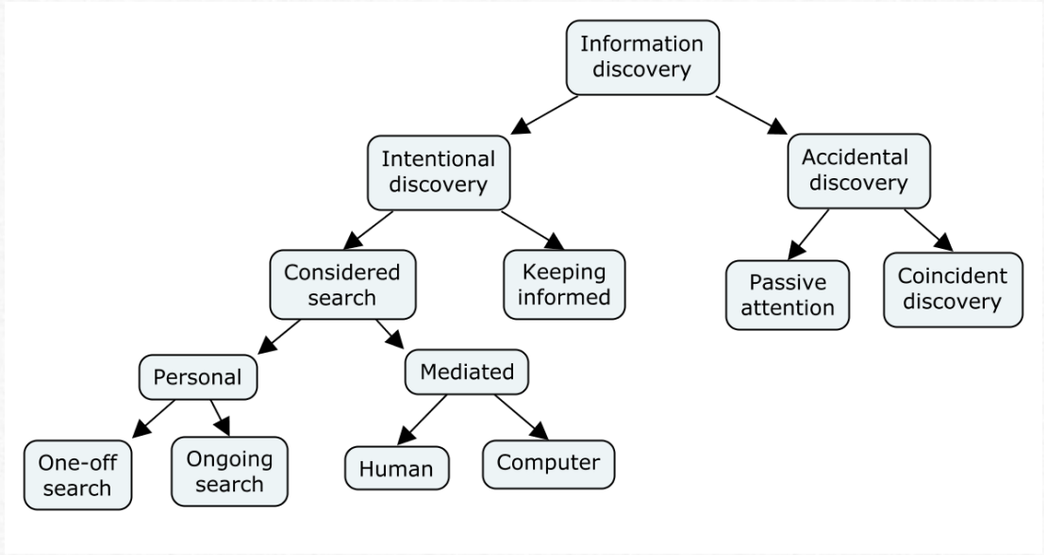


Figure 4.6: Typology of information discovery

What we end up with, then, is a typology of information discovery (as shown in Figure 4.6), in which each mode is capable of being further analysed and modelled, depending upon the search environment.

We have to take account of the fact that, just as various factors may intervene between the need to find information and the actual engagement in information seeking, so other factors may intervene in gaining access to information resources. Intervening variables that may have seemed less significant at the point of deciding to search for information, may now assume more significance, when the person has to start the search process. For example, suppose someone has Internet access and can find wanted documents or data; they carry out a search, but then discover that one apparently relevant document is not openly available, but requires a thirty dollar charge. The individual now must decide whether there is sufficient probability that the document will prove useful to justify the financial risk involved. Similarly, a person at an earlier stage may believe that they are competent to carry out a search for information, but, when faced with having to carry out the search, may discover that they lack the necessary skills.

At this point we can expand the earlier model (Wilson, 1999) to include this new formulation of discovery modes, resulting in Figure 4.7.

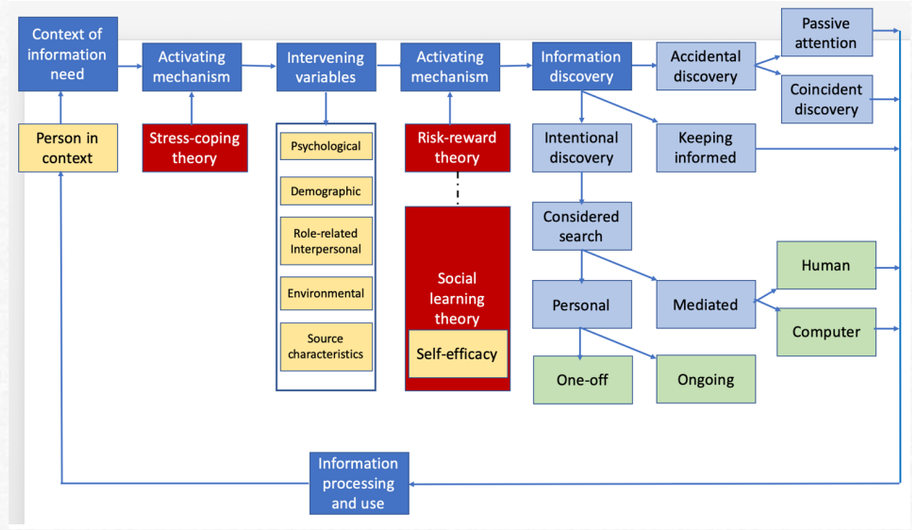


Figure 4.7: An expanded model

Modelling the information search

We have noted that information resources come in many forms, from other people to the daily newspaper and the online database. How people approach and use these resources and the access tools is clearly part of information behaviour and it is evident that different tools and resources probably require different modes of access.

For example, if I enter a bookshop to look for a book on, say, the martial art aikido, I could make a short cut and approach a staff member and ask if anything is available. But, if everyone is busy

serving other customers, I will probably look for signs announcing the kinds of books on the shelves. Part of a stack may be labelled *Sports*, and I may head over there, although I may think that aikido is something other than a sport. I'll browse through the books in that section and, if I'm lucky, I'll find a sub-section with books on various martial arts, including aikido.

I may go through a similar process in searching for a book in a library, browsing the appropriate part of the shelves to find something, rather than searching the catalogue to find something specific. In both cases, any model would be rather simple, since the only observable action is *browsing:* what is going on in the mind of the browser is inaccessible to us, unless we follow the person around and ask him or her to talk aloud about what they are doing (see, for example, Ingwersen, Johansen and Timmerman, 1980).

Today, of course, we continue to interact with other people in our search for information, and we continue to browse in bookshops and libraries. We even *browse* the advertised apartments and houses of sale in the windows of estate agents. Increasingly, however, with the development of the World Wide Web, much of the information we need is online: booksellers' catalogues are online, estate agents' offerings are online, the world of scholarship is online. Databases of all kinds are online, and search engines have been designed to help us interrogate these resources.

Just before these events occurred, however, Kuhlthau (1991) produced one of the most influential models of the information search process. This was based on the search activities of high activities of high school students in the USA, supported by further interviews with some of the participants following their four years of undergraduate education, and with other studies of users of academic and public libraries. Kuhlthau's model proposes that the information search proceeds through six stages as shown in Figure 4.8.

Tasks	Initiation	Selection	Exploration	Formulation	Collection	Presentation
Feelings (affective)	uncertainty	optimism	confusion frustration doubt	clarity	sense of direction/ confidence	satisfaction or disappointment
Thoughts (cognitive)	vague ----------→			focused	------- increased interest ----------→	
Actions (physical)	seeking relevant information ----------→				seeking pertinent information	
		exploring				documenting

Figure 4.8: Kuhlthau's (2004) model of the information search process

The model shows the affective, cognitive and physical actions performed through the six stages of the process and the six stages are described as follows:

***Initiation**: "when a person first becomes aware of a lack of knowledge or understanding, feelings of uncertainty and apprehension are common. At this point the task is merely to recognize a need for information."*

***Selection**: "the task is to identify and select the general topic to be investigated or the approach to be pursued."*

***Exploration**: "The task is to investigate information on the general topic in order to extend personal understanding".*

***Formulation**: "is the turning point of the ISP* [information search process] *when feelings of uncertainty diminish and confidence increases.The task is to form a focus from the information encountered."*

***Collection**: "is the stage in the process when interaction between the user and the information system functions most effectively and efficiently. At this point, the task is to gather information related to*

the focused topic."

***Presentation**: "The task is to complete the search and to prepare to present or otherwise use the findings… Actions involve a summary search in which decreasing relevance and increasing redundancy are noted in the information encountered."* (Kuhlthau, 1991, p. 366-367).

Kuhlthau's model was created before the explosion of electronic documents and the ubiquitous use of the search engine, but the stages are sufficiently generic to apply to electronic search as well as to physical search.

Some years earlier, Ingwersen (1982) produced a series of stages of the search process of public library users:

1. *Information need of user (deriving from a problem situation)*
2. *The formulated information need of user*
3. *User-librarian negotiation*
4. *Developing the search profile—topic analysis*
5. *Choice of tools*
6. *Looking up. Systematic or alphabetic*
7. *Judgement based on index (terms)*
8. *Judgement based on descriptions, abstracts, titles*
9. *Evaluation of the documents themselves* (p. 167)

which shows a degree of similarity to the stages identified by Kuhlthau, such that Ingwersen's Stages 1 and 2 are similar to Kuhlthau's *initiation* and *selection*; Stages 3, 4 and 5, may be seen as part of *exploration*; Stages 6, 7 and 8, part of *formulation*; and Stage 9 a component of *collection*.

Marchionini's (1995) analysis of the search process was based specifically on the use of electronic resources and search systems and, again, shows some similarity to the proposals of Kuhlthau and Ingwersen. Marchionini's stages are:

Recognition and acceptance of an information problem [related to Initiation]
Defining and understanding the problem [related to Selection]
Choose a search system; Formulate a query; Execute search [related to Exploration and Formulation]
Examine results; Extract information [related to Collection]
Reflect, iterate, stop [partially related to Presentation] (p. 51-58)

Marchionini's diagrammatic model includes feedback loops linking all stages, which is the reason for his inclusion of *iterate* as one of the final steps. In any search, whether manual or digital, the searcher may return to an earlier stage to review their ideas and, for example, reformulate a search query.

Ellis's exploration of the search process, which also predated the digital revolution was pursued through his PhD dissertation (1987) and further work independently (1989, 1993) and with Masters' students (1993, 1997). Ellis writes of *characteristics* of the search process, rather than stages, and initially identified six:

1. Starting: activities characteristic of the initial search for information;
2. Chaining: following chains of citations or other forms of referential connection between material;
3. Browsing: semi-directed searching in an area of potential interest;

> *4. Differentiating: using differences between sources as filters on the nature and quality of the material examined;*
> *5. Monitoring: maintaining awareness of developments in a field through the monitoring of particular sources;*
> *6. Extracting: systematically working through a particular source to locate material of interest.* (Ellis, 1989, p. 178)

Ellis went on to note that,

> *the detailed interrelation or interaction of the features in any individual information seeking pattern will depend on the unique circumstances of the information seeking activities of the person concerned at that particular point in time.* (p. 178)

It is fairly obvious, however, that these characteristics have an affinity to the stages of Kuhlthau and of Marchionini, although we respect Ellis's concern that they should not be treated as stages. Through further research, (Ellis and Haugen, 1997) the characteristics were increased to eight, with *starting* being renamed *surveying,* followed by *chaining, monitoring, browsing, distinguishing, filtering, extracting,* and *ending*. Distinguishing and filtering, appear to be replacements for the earlier *differentiating*.

Ellis's study was replicated by Meho and Tibbo (2003) who found that a further four activities were necessary to describe the behaviour of the social scientists they studied. These were: *accessing, networking, verifying,* and *information managing*. The authors note that,

> *Although not all of these new features are information searching or gathering activities, they are tasks that have significant roles in enhancing information retrieval and facilitating research' (p. 583).*

Unlike Ellis, Meho and Tibbo also grouped the features into four stages: *searching*, which could involve a variety of the features, including chaining, browsing, monitoring, networking, etc.; *accessing*, which would involve deciding whether to carry out further searches, or to proceed to the next stage; *processing,* involving chaining, verifying, extracting, and information managing; and *ending*.

It is not surprising that there should be similarities among the different models of information searching, as all researchers are exploring the same phenomenon. It *would* be surprising if very great differences were found. It is worth noting, however, that some of the differences may result from the differing motivations of the researchers. Kuhlthau was interested in improving the role of the school library in the learning process; Ingwersen in improving public library services to the user; Ellis and Marchionini in designing and/or evaluating information retrieval systems; and Meho and Tibbo, also in improving the design of existing database and digital library systems. The times at which the research was conducted also made for differences: some were carried out in the world of physical resources, others in the digital environment.

We could now take one of these models, or produce an amalgamation of all of them, and use it to extend Figure 4.7, by further elaborating the personal one-off search, and, perhaps, the personal, continuing search. It may be that the mediated search by a

human would involve the same elements, and one might even imagine a computer agent performing somewhat similarly. This still leaves the other modes of information discovery to be analysed.

Modelling information processing

In previous attempts at modelling information behaviour I have refrained from attempting to model information processing and use, simply because the first part of this process, i.e., information processing, is evidently a mental activity and, therefore, not amenable to direct observation. We may, of course, attempt to observe our own mental processes as we assimilate and make decisions about the information we discover or that is presented to us. This is known as *introspection* (also *metacognition*), which has been used as a research method in psychology, but about which there has also been a good deal of criticism. In information science research we come into contact with the idea in the form of *thinking aloud*, e.g., asking a research participant to verbalise what they are thinking as they carry out information-seeking tasks. This only gives us access to what the participant is able to access and not to whatever *unconscious* operations may be taking place. There is even the concept, in neuroscience, of *pre-consciousness*, supported by the discovery that the brain may issue an 'instruction' for a finger to be moved before the person is aware of the need to move it. I am not aware of any such research related to information searching but it would be interesting, to say the least, if it was found that action to click on an item in a search list preceded the conscious decision on that item's relevance.

Various models have been devised on the conscious stages of information processing, especially in relation to human-computer interaction, where the GOMS (*goals, operators, methods* and *selection* rules) model and its variants have been employed. However, these stages appear to be more in the nature of stages of *interaction* and whether the human brain has operations that parallel these stages is unknown. GOMS and other models that claim to say something about human information processing are clearly systemic in character and somewhat mechanistic, i.e., stage 1 precedes stage 2, etc., the human brain is not mechanistic, however, but a complex organic structure. We can record, for example, which neurones in the brain 'fire' during certain mental and physical activities, but it is difficult to infer from this what exactly is going on in the electro-chemical activities that relate to information processing.

Other models of the mental processes involved in, for example, reading, have been developed and show the complexity of what is involved in what we may consider to be an ordinary, everyday activity. Consider a single word, like "word": the fluent reader grasps this pattern of lines as a whole, but, as a child, had to learn the sounds associated with the individual combination of lines that formed each letter. In reading, the child had to progress from seeing this code as a series of letters with individual sounds, to an entire word with a sound different from the composition of the individual letters, learning, for example, that 'c' 'a' 't' when put together have a sound represented phonetically as 'ka:t' (or, in US English 'kæt'). So the visual system of the brain is involved, as well as the aural system, and then the meaning of the word has to be learnt and understood, involving the higher cognitive processes of the brain that are involved in establishing long-term memory. Eventually, almost everyone learns to read fluently, the processes we learnt as children now being

automatic: those who fail to learn are said to be *dyslexic*, which is rather odd as the word is derived from two Greek words that mean difficulty in *speaking*!

We can also refer to the notion of the modular mind, discussed earlier in this chapter. If, indeed, our behaviour is prompted by the postulated modules, then it seems logical that the information we gain through that behaviour will be processed by what is, at the time, the dominant module or network.

For example, suppose that, at some point in time, our behaviour is driven by the 'status' module, and we are looking at job advertisements, then whatever information is presented in the advertisement will be assessed according to its relevance for improving our status. In doing so, of course, the status module will use the neural network established in the brain for reading and, presumably, other networks exist to enable comprehension, but the dominant network in assessing the relevance of each job advertisement will be, according to this theory, the status module.

This leads me to conclude that 'information processing' in the neurological context is not capable of being modelled at the level that would be of interest to the student of information behaviour. We know that when information is received by a person it is processed, and we also know that how the information is presented may affect its reception and understanding, but the neurological processes involved in this are too complex to be modelled in any simple manner. However, the physical processing of information outputs also takes place: physical documents may be filed, and electronic documents may be kept in electronic 'filing cabinets', and this is the concern of personal information management, defined by Jones (2008, p. 453) as '*the activities people perform in order to acquire, organize, maintain and retrieve information for everyday use*'.

Modelling information use

How information is put to use, however, is a different matter entirely. Here we can ask people what benefit they derived from having information, and how they used it in relation to whatever need had arisen.

In a follow-up to the INISS Project, in which many of the ideas presented here originated, one of the tasks was to discover how recipients of a locally-produced information bulletin, the *Social Work Information Bulletin*, used the photocopied material they requested. The users were presented with three items they had requested and the questions put were very simple: Can you recall getting this item? Why did you ask for it? and What use did it serve?

Table 4.1 shows the results of that investigation, which identified three categories of use: providing background information that supported one's existing knowledge; contributing to the performance of a specific task; and the inevitable, 'other uses'. There were sixty-six respondents in total, meaning that some of the respondents offered more than one use for a given item. For example, a document might confirm one's own ideas on a topic and that information might be subsequently used in writing a report, and/or be presented in a meeting.

In an interesting paper, Kari (2010), reports the discovery of seven different ways in which *information use* has been conceptualised by researchers, i.e.:

‘• *information practices - almost any kind of human interaction with information;*
• *information search - the processes of information seeking and information retrieval;*
• *information processing - information is interpreted, analysed and modified...;*
• *knowledge construction - mental constructs are shaped or designed to function as a basis for thinking...;*
• *information production - creating an expression of knowledge which others can also observe;*
• *applying information - information functions as a resource in some process;*
• *effects of information - changes brought about by information.’*

It will be seen that the ‘uses’ shown in Table 4.1 may fall into the categories, knowledge construction, information production, applying information, and effects of information (note, for example, ‘providing security’).

As a result of this analysis we can offer a simplified diagrammatic model of information use, as in Figure 4.9.

The model is simplified in that, for example, not all ‘applications’ are shown, nor are the modes of ‘one-to-one’ and ‘one-to-many’, but readers will be able, I am sure, to expand these concepts.

Conclusion

Models are essentially tools for thinking about a problem or issue that is of interest to us. Diagrammatic models inevitably simplify the subject of interest, since they grow rapidly as we identify new features

Use made of an item	N. of respondents	% uses
A: Providing background information		
1 Supplemented/broadened knowledge	31	33
2 Confirmed own ideas, or prior act	7	8
3 Gave comparison with others' ideas or practice	6	6
4 Helped to clarify own ideas	4	4
Sub-total	***48***	***51***
B: Contributed to a specific task		
5 Quoted in meeting	5	5
6 Gave practical guidance - how to do something	3	3
7 Aided report-writing	2	2
8 Aided lecture preparation	2	2
9 Aided preparation of a play	2	2
10 Aided- essay writing	1	1
11 Provided basis for a project	1	1
Sub-total	***16***	***16***
C: Other uses		
12 Aided own training or personal development	9	10
13 Information passed to colleagues	8	9
14 Kept for reference	7	8
15 Provided 'security'	2	2
16 Information passed to clients	2	2
17 Personal problem	1	1
Sub-total	***29***	***32***
Total	***93***	***99***

Table 4.1: Use made of documents

of the problem or formulate new explanatory concepts. If the notion of people possessing different learning styles is true, and they divide into *verbalisers* and *visualisers*, a further problem is that verbalisers are much happier with the written word than they are with diagrams. Thus, Figure 4.7 could be represented entirely in words and it would still constitute a model.

Conversely, of course, visualisers are often much happier drawing diagrams to explain things to themselves than they are with trying to write down a full explanation.

The next Chapter is about the relationship between models and theories.

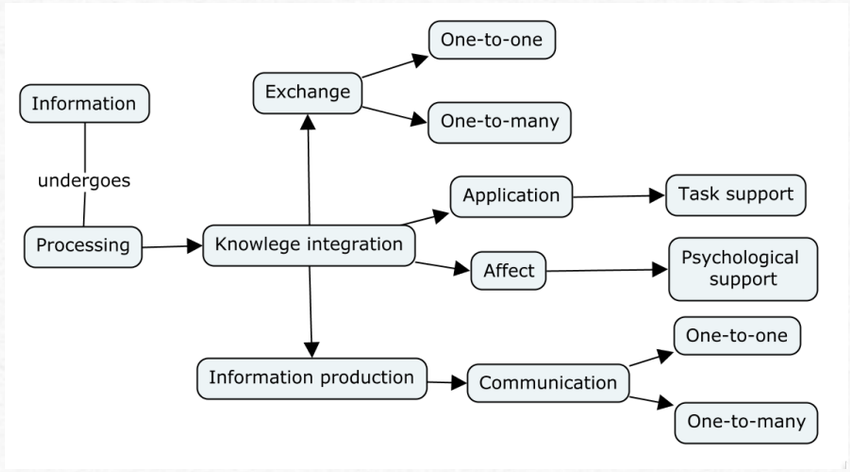


Fig. 4.9: Information use

Think about it

1. How many different roles do you see yourself engaged in? Is your personal information behaviour different in those different roles, or is there something common to all?
2. Thinking about the last occasion on which you had to search for information, which of the different models presented in this chapter appears to fit best to what you did?
3. Consider your own information behaviour and reflect upon how you have used the information you obtained. Do the categories set out by Kari cover all eventualities, or do you find more?
4. Consider the *keeping informed* box of Figure 4.6: reflecting on your own behaviour in this respect, what actions would you use to analyse the concept further?

Models and theories

5

Exploring the relationship between models and theories. Proposing a general theory of information behaviour.

Models and theories

What is theory?

The word *theory* has many uses: we use it in ordinary speech simply to mean an idea about, for example, the cause of a problem, 'My theory is that...' When used in this way, we do not intend to imply that we have carried out some serious investigation into the problem, collecting and analysing data, but simply that we have an idea about a probable cause.

This fluidity of meaning is represented in the dictionary definitions of the term; for example, the online *Oxford English Dictionary* gives nine definitions, including, '*a hypothesis or set of ideas about something'*, which corresponds to the paragraph above.

In scientific research, however, a different definition from the *OED* applies, that is: '*An explanation of a phenomenon arrived at through examination and contemplation of the relevant facts; a statement of one or more laws or principles which are generally held as describing an essential property of something.*' Hence, we have atomic theory, quantum theory, the general theory of relativity, and so on. Such theories are held to produce testable predictions, i.e., given a particular set of circumstances, the theory will aid the prediction of consequences, if those consequences are verified, the theory is supported, if the prediction fails, theory has been falsified.

Theory in the social sciences, however, rarely has this characteristic. Theories tend to be explanatory, rather than predictive; that is, theories are used to try to explain why social phenomena are the way they are, rather than predicting how those phenomena might change.

The reasons for this are readily understandable: the first point is that the subjects of social research are people like the investigator, neither are they abstract entities that we might find in mathematical theory nor are they observable phenomena in a laboratory, although, of course, we may conduct laboratory experiments that involve humans. In the course of research they interact with the researcher and their behaviour might change as a consequence of that interaction. Thus, a description and explanation of someone's search strategy, might lead to changes in the person's future strategy simply as a result of learning about alternatives from the questions asked by the researcher.
The second point is that a person's behaviour is continually affected by changes in their environment. Those changes may be political, economic, environmental, social or technological and, as the circumstances change, behaviour changes. We can illustrate this readily by reference to changes in the nature of information resources over time.

Until the emergence of the Internet and the World Wide Web a person's search behaviour was constrained by the physical nature of information resources. Abstracting journals existed, such as *Chemical Abstracts* and *Library & Information Science Abstracts,* which had to be searched manually to discover relevant articles, those articles had to be found in the library's journals, or obtained by inter-library loan. If thought relevant, they might be photocopied and retained in a box file or a filing cabinet.

Today, the researcher's behaviour has been transformed by the application of computers, and the invention of the personal computer, and the World Wide Web. The same person, if alive today, will carry out a search almost entirely online, the abstracting journals having been converted to online databases, and will download articles into their own 'digital library'. They may then write their own paper by word-processor and never handle a physical copy.

Not even the most detailed analysis of the behaviour of the researcher in, say, 1975, could have led to a prediction of how someone in the same role would have behaved today.

We can probably say the same today: we do not know what changes will take place in the researcher's environment in future years and, therefore, if predictions are made, they are unlikely to be accurate.

We can conclude, therefore, that, for our purposes, theories relating to the behaviour of people interacting with information are likely to be explanatory rather than predictive and that such theories are likely to be time-bound, as the nature of society changes over time.

How do models relate to theories?

We have defined a model, in Chapter 3, as, '*an abstract representation of some aspect of human behaviour*' and, since theories are also abstractions, it seems reasonable to ask what the relationship is between models and theories.

The answer is far from simple, and authors seem rarely to agree on the subject. However, I see the relationship as two-fold: a model may be constructed through the observation and recording of behaviour in some generalised way that leads to a grouping of categories of activities and influencing factors. Thus, we may construct a model of consumer behaviour by observing shoppers in a supermarket, noting the way they move through the store, whether or not they have a shopping list, whether their progress seems to be

random or structured, and so on. As a result of our research we may then construct a diagrammatic model that seeks to generalise the notion of a ‘supermarket shopper’.

The models discussed in the previous Chapter are models of this kind. They have been developed through research into information behaviour in a wide variety of settings and attempt to relate categories of variables in an explanatory manner.

Models of this kind may be viewed as precursors to theory and, in this chapter I shall suggest that a theory can be derived from those models.

On the other hand, a theory may itself generate models: a theory may be developed without any prior modelling of the variables that are involved in the theory. Models are derived from theories to communicate the ideas more effectively and, for example, to illustrate the directions of associations among variables discovered in the theory-based research. Take, for example, the theory of reasoned action (Fishbein & Ajzen, 1975), which proposes that a person’s behaviour is determined by their behavioural intention, which is, in turn, determined by their attitudes toward the intended behaviour and by the subjective norms that refer to the proposed behaviour; that is, the extent to which the behaviour is approved by those whom the person regards as peers or influential persons.

In turn, attitudes are held to be determined by the person’s beliefs about the proposed behaviour and the likelihood of it leading to a desired outcome, while the subjective norms are determined by the person’s beliefs about the attitude of other persons towards the behaviour and their motivation to conform to those beliefs.

It will be evident that we can now construct a diagrammatic model of the theory of reasoned action and, indeed, such models proliferate in the literature, most of which resemble Figure 5.1, which, as you see, is a very simple representation.

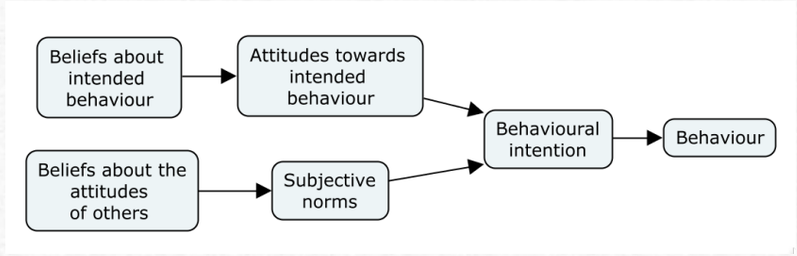


Figure 5.1 Theory of reasoned action

Deriving theoretical propositions from models

If we can create a model from a theory, it seems reasonable to ask whether the reverse is true, that is, can we derive theoretical propositions from a model? Clearly, if there is a logical connection between model and theory the answer must be ‘Yes’.

Let us consider Figure 3.4 again (see Figure 5.2). This model suggests that the need for information is associated with more fundamental human needs that may be divided into physiological (e.g., the need for sustenance), the affective (e.g., the need for affiliation), and the cognitive (i.e., the need to know, to support learning, task performance, etc.). It also suggests that these needs arise out of the different roles the person plays in society, from roles in the family to roles at work, and, again, that these different roles will be performed differently depending upon the nature of the

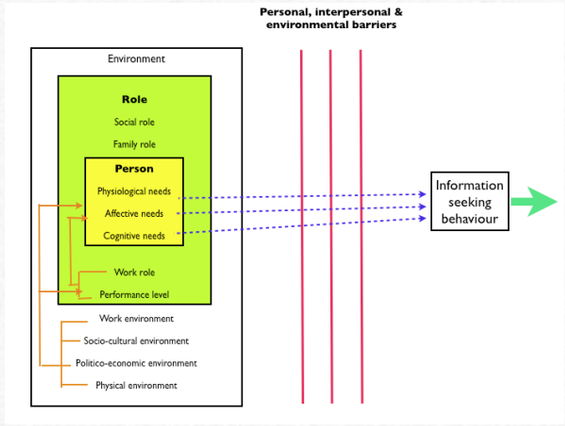


Figure 5.2: The context of information need

'environment' within which the person finds him or herself.

We can now, readily, propose certain theoretical propositions: for example:

Work-related information needs will vary according to the nature of the role performed by a person in their job.

Persons with similar work roles in similar organizations will experience similar needs for information to support their work.

Willingness to share information in a society will be affected by the socio-economic and socio-cultural environment in which people work.

Note that these are not statements of fact, but, simply, testable propositions. Let us call them propositions within a contextual theory of information need: the fact that they are testable means that we do, indeed, have a theory. We can actually conduct research to determine whether or not these propositions are true. If we find they are not true, the theory is falsified, if we find evidence to support them, the theory is supported. In the scientific sense of the word, a theory must be falsifiable: if we cannot test the propositions, they are not related to theory, but are simply statements of opinion or belief.

Similarly, we could take the other diagrammatic models of Chapter 3 and derive theoretical questions from them, to the extent that, I believe, we can propose a general theory of human information behaviour, or, perhaps, of human interaction with information.

It should be noted that a theory may itself be modelled. In science, computational models of theories are a valuable tool in testing the validity of theory. Computer simulations of phenomena are generally based on theories that define how variables are related to one another and in what strength they affect the phenomenon. Thus, computer simulations of our weather are based on theories relating to the movement and warming masses of air in the atmosphere, wind speeds, precipitation levels, and so on.

Using theory in information behaviour research

Even a casual acquaintance with the literature would make it obvious that a various theoretical perspectives have been employed in research into the interaction of humans with information. Not surprisingly, the theories employed are drawn from the behavioural sciences, including psychology, social psychology, sociology, communication and media studies, and education. Indeed, there is often overlap among these fields with activity theory, for example, having its origins in Soviet psychology, then being employed in education, and now featuring in information science, information systems, and management.

Given the diversity of approaches, it seems reasonable to ask, 'What is the purpose of theory?' and 'Why one theory, rather than another?'

Activity theory

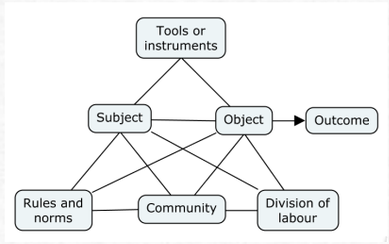
The answer to the first of these questions is quite straight-forward: the purpose of theory is to give rise to research questions and to guide the research process. Consider, for example, activity theory, which has been touched upon earlier. Another name for the theory, which draws attention to factors that are crucial for information research, is *cultural-historical activity theory* or CHAT, with the *cultural-historical* element drawing attention to the significance of context.

At its basic level, activity theory proposes that a *subject* uses *tools* (which may be artefacts or abstract tools) to achieve some object. We can immediately see propositions arising out of this simple triad that are of relevance to research into our interaction with information. For example, what tools does a PhD student use in searching for information of relevance to his or her research objective? We could be more specific and ask, to what extent does the information retrieved through the use of Google (a tool) allay the anxiety of a patient seeking information on their upcoming operation for gall bladder removal?

In other words, simply thinking about the *subject, object* and *tool*, is enough to generate research questions.

As developed by Engeström (1987), however, for use in educational research, activity theory includes three more elements: *rules and norms, community,* and *division of labour,* leading to the model shown in Figure 5.3.

When we add these elements to the model, the range of potential research questions increases considerably and we are offered increased variety in our choice of overall research subject. For



example, instead of being interested in the range of tools employed by PhD students in their searches, we may rethink our research completely and ask, 'Given the community of scholars within which the PhD student works, what rules and norms exist, regarding the research process, which affect the use of sources and, within the research team, what division of labour takes place in discovering relevant information?

As we can see from these examples, activity theory enables us to take either an individual perspective on the search for information, or a social perspective, i.e., the person as member of a team.

Taking the cultural-historical dimension of activity theory, our attention will be drawn, for example, how current practice in information seeking has been formed over time and within the particular societal or organizational culture of interest. For example, we can contrast the team culture of PhD research in the sciences, where the doctoral candidates are often studying a specific aspect of the problem of interest to the research team, with the independent scholar culture of the humanities PhD. Our interest may then be in exploring how these different cultures have arisen over time, and what their impact is on the information seeking behaviour of the doctoral candidates in different fields.

Activity theory has been advocated in information science (Wilson, 2006, 2008) and significant research has been undertaken, for example, Allen, Wilson, Norman and Knight (2008), Allen,

Karanasios and Slavova (2011), and Widén-Wulff and Davenport (2007).

Personality theory

As an alternative to activity theory, we can explore personality theory. Here, instead of the rich, contextual framework of activity theory, we have a focus on the individual. There are several personality theories and I shall take trait theory as representative.

As Heinström (2013) points out, following a period in which the notion that personality could influence behaviour was contested, trait theory emerged as one that was supported by a significant weight of research evidence.

The number of traits that a person may possess varies according to which researcher has been involved in developing them. For example, Cattell (1943) came up with a list of sixteen, while Murray (1938) identified twenty-seven needs underlying personality traits. More recently, however, research has focused on a smaller group of traits known as the Big Five, with the acronym OCEAN identifying Openness to experience, Conscientiousness, Extroversion/ introversion, Agreeableness, and Neuroticism (Goldberg, 1993).

What relevance might trait theory have for information behaviour research? The theory is, of course, that we possess all five traits to varying degrees, with some stronger than others and a related research question would be, "Is there any relationship between personality traits and information behaviour?"

This was the essence of the research questions in Heinström's work (2003); she found associations between the five personality traits and aspects of information behaviour, for example:

> *Neuroticism - the vulnerability to negative emotions - was related to preference for confirming information, feeling that lack of time was a barrier to information retrieval, difficulties with relevance judgement and insecurity in database searching. These connections suggest that negative emotionality may form a barrier to successful information retrieval. This influence seems related to personality inclination as well as to temporary states of anxiety...*
> (Heinström, 2003)

Of course, research of this kind requires a sound knowledge of personality theory and the use of standard tests (in Heinström's case, the NEO Five-factor Inventory), and the necessary statistical skills to analyse and interpret the data.

Social cognitive theory

As a third example, we can consider social cognitive theory, a key element of which is the idea of *self-efficacy* (Bandura, 1982), which can be defined as the extent to which a person feels capable of dealing with a prospective situation. Bandura notes that, in his research:

> *Increasing levels of perceived self-efficacy both across groups and within the same subjects gave rise to progressively higher performance accomplishments. (Bandura, 1982, p. 124)*

Or, in other words, the more capable a person perceives themselves to be in relation to a task, the better they perform that task. It is also noted that persons with high self-efficacy are likely to put more effort into the task.

It was proposed, in the models discussed in Chapter 3, that *self-efficacy* could be one of the factors that determine whether or not a person engages in a search for information and, obviously, this can be tested in research. For example, Pálsdóttir (2008) explored the relationship between self-efficacy and health information seeking, finding that the most active information seekers were mostly well-educated women with high self-efficacy scores, while the least active were mainly less-well-educated men with low self-efficacy scores.

This result raises further research questions, of course, such as, What is the connection between education and self-efficacy? What factors, other than education, result in men perceiving themselves as less self-efficacious? What are the health consequences for those who are more, or less, likely to seek information on health? And so on.

Practice theory

Over recent years, practice theory has been proposed, and used, in information behaviour research. Some proponents have argued that the term practice is more appropriate than behaviour, because the term is more associated with social behaviour. This ignores the fact that practice theory is just another theory of human behaviour and is no more associated with the social aspects of behaviour than is, for example, activity theory, where the concepts of division of labour, community, rules and norms, and the cultural-historical context, play a major role.

However, practice theory, of one kind or another is certainly a valid approach to research into human interaction with information. The key question is, Whose practice theory? Three scholars are commonly associated with the concept: Pierre Bourdieu, Anthony Giddens, and Theodore Schatzki.

In his *Outline of a theory of practice* (1977), Bourdieu develops the concept of habitus, which is closely associated with the idea of social practices. A very abstract concept, habitus consists of the embodiment of the habits and dispositions we acquire through our life experience: habitus both shapes how we act and creates the conditions under which we act. This idea, simplified somewhat to the concept of *way of life*, finds a place in the work of Savolainen on everyday life information seeking (1995, 2008).

Giddens's structuration theory (1986) has something in common with the work of Bourdieu, as it too seeks to demonstrate how social action both shapes and is shaped by social systems. Our practices in the world are shaped by the social structures we exist within (family, workplace, religion, etc.), and, at the same time, play a role in shaping those structures. Structuration theory is not much used in the field of information behaviour, but there is some work, for example, that by Cho and Lee (2008), on collaborative information seeking in computer-mediated communication. People using question and answer sites on the Web are also engaging in information-related behaviour, and Rosenbaum and Shachaf (2010) have applied structuration theory to this mode of behaviour.

Although Schatzki's practice theory (1996) is presented as different from the formulations of Bourdieu and of Giddens, there is much in common, since all three scholars are reacting against the notion that human behaviour is determined by the social systems within which they function. For Schatzki, the whole of the social world is a 'field of practices' (Schatzki, 2001, p. 11), made up of 'integrative practices', i.e., those complex social practices such as governing and running a business, and 'dispersed practices', which include 'questioning, reporting, examining and imagining' (Schatzki, 1996, p. 91), which we might take to be the individual, intellectual practices of the human animal. Schatzki's practice theory has found some support in information research, for example, in information literacy (e.g., Lloyd, 2010), and in information seeking behaviour (e.g., Pilerot, 2013).

It could be argued that information seeking is a dispersed practice, like reporting and questioning, and the question then arises as to how far it can be considered the shared practice of a collective, which is another tenet of practice theory.

These examples of the application of theories from the social sciences are enough to demonstrate the connection between theory and research questions, and they also show that theories from a wide range of the behavioural sciences have implications for information behaviour research.

However, no theory is without its weakness and its critics and it is always advisable to know what these are. The shortcomings of activity theory are highlighted by Davydov (1999); criticisms of trait theories of personality are reviewed by Kihlstrom (2017); although related to information systems research Carillo's (2010) review and critique of social cognitive theory is useful for information scientists; and a critique of practice theory, with particular reference to Schatzki and Bourdieu, is presented by Schmidt (2018).

Developing theory

While using existing theories is a perfectly valid, and probably the most common, mode of identifying interesting research questions, we may have our own ideas about the relationships among phenomena of interest, or we may get such ideas from reading existing research and asking, Where do we go from here? In these circumstances we are already thinking theoretically about the area of interest.

Quite how theoretical ideas emerge is difficult to determine, since different people will experience things differently. However, we can say that theories are tentative answers to the questions, "Why?" "What?" "How?" And these questions come about through our observation of whatever is of interest to us. For example, a university librarian may look at the behaviour of undergraduates in the library, noting, perhaps, that some will prefer to wait for the return of a book from another reader, rather than consult the e-book equivalent. Why? Simply asking the question leads one to propose explanations– theoretical answers to what is now a research question.

The same process may occur when we read a body of research literature on a particular problem. We may end up asking whether or not the answers provided in the literature cover all the possible explanations. We may ask ourselves, "Why did the researchers not consider *this* possibility?" and then go on to research the topic from this new perspective.

Whenever we operate in this way, we are thinking theoretically. But simply thinking theoretically is only one way of developing theory, and in *Theory development in the information sciences* (Sonnenwald, 2016), a number of researchers, drawn from information science, human-computer interaction, and computer-supported collaborative work, set out what are very diverse ways of developing theory.

In the social sciences, where we are concerned with human behaviour, we also have the opportunity to research behaviour with the intention of developing theory, rather than simply testing theoretical ideas. This is the method explored in *The discovery of grounded theory*, by Glaser and Strauss (1967). The title of the book describes exactly what it is about, i.e., it is not about a specific theory called grounded theory, but about how to ground theory in data, or, as the authors put it:

> *the discovery of theory from data systematically obtained from social research (Glaser and Strauss, 1967, p. 2)*

It should be noted, here, that, although Glaser and Strauss conducted qualitative research, Glaser (1978), in particular, noted that the methods described should not be limited to qualitative research, but that quantitative data, from surveys for example, could equally well be subjected to the grounded theory approach to data analysis. This is not surprising, given that Glaser trained in quantitative methods under Paul Lazarsfeld at Columbia University.

Typically, however, researchers write about 'using grounded theory', as though there *was* a theory to be used, when, in fact what they mean is that they use a qualitative analysis process based, mainly, on that proposed by Strauss and Corbin (1990).

Very often, it is not clear what the author of a paper means by 'using grounded theory': sometimes it refers simply to collecting qualitative data through interviews, sometimes the use of *theoretical sampling*, and sometimes, as noted above, it means using the proposed coding techniques. In a collection of 156 papers discovered by searching for `"information seeking" OR "information behaviour" AND "grounded theory"`, only thirteen reported the development of a theory or a conceptual model. This suggests that, if authors had moved beyond the extraction of themes for the analysis of behaviour to the stage of 'theoretical coding', theory development would be much more prevalent in the literature.

However, even when researchers claim to be 'developing a theory', the actual result may be something short of a fully developed set of theoretical propositions linking concepts in meaningful ways. For example, Rhee's paper (2012) is an interesting example of model development, based on previous work by Meho and Tibbo (2003), which, in its turn, was based on Ellis's (1989) search characteristics. The result was a *process model* describing the behaviour of historians, using an expanded set of the characteristics developed by Ellis, and identifying key differences between the social scientists previously studied, and historians, rather than a *grounded theory*.
In another case, Pollack (1996) undertook a study of people with manic-depressive illness in order to,

> *develop a descriptive theory of the information-seeking states of hospitalized people with manic-depressive illness, as the first step in generating a substantive theory of the self-management informational needs and activities of this population. (p. 259)*

What actually results, is a *typology* of information states, which categorises people as novice, recent acceptor, veteran, passive acceptor, acknowledged denier, acknowledged rejecter, and complete rejecter. The author notes that these states are not necessarily permanent states, and that people can shift from one to another over time.

This is a useful step on the way to a *theory* of information states, but research would be needed to determine what factors in the environment, family history, communication with health professionals, personality type, etc., etc., are significant in a person being allocated to one or other of the *ideal types*.

As a final example, McCaughan and McKenna (2007) interviewed newly diagnosed cancer patients. The final paragraph of their paper sets out the results:

> *This study mapped out the stages in the process of information-seeking by patients newly diagnosed with cancer. It shows the complexity of their reactions and their social psychological struggle they face in trying to make sense of their condition and of ways to regain some control over their lives. There are times when information is barely absorbed and times when they are ready to 'open-up' and take active steps to 'take on' the disease and its consequences. (p. 2103).*

This involved the authors developing a theory of the stages through which a patient passed, from being *traumatised* by the initial diagnosis (which had a 'blocking effect' on information-seeking), through *taking it on*, when the patient faces up to the disease, but when information discovery is haphazard, to *taking control*, when information seeking becomes more purposive. Some patients, of course, never move to the point of taking control.

These examples demonstrate that *developing a theory* can mean different things and the authors rarely write about exactly how they arrived at their *theory*. In this respect, two aspects of coding are central to the process.

First, *axial coding* is the process through which the codes developed in the initial coding of the qualitative data are related to one another. Strauss and Corbin (1990) proposed a *coding paradigm* for this purpose, as shown in Figure 5.4

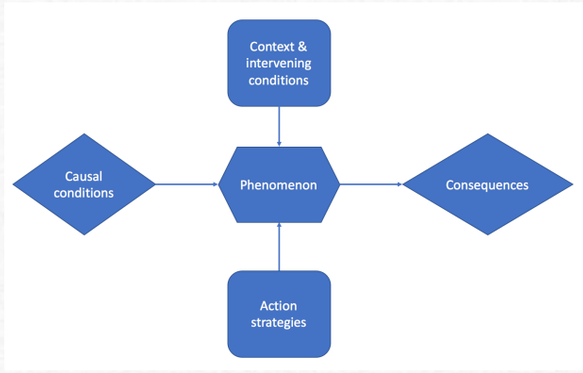


Figure 5.4 The axial coding paradigm Based on Strauss and Corbin (1990).

We can illustrate this by reference to a hypothetical case. Suppose our phenomenon of interest is the use of social media for the discovery of information: the context is the interest of the searcher, which, in this case, relates to *atrial fibrillation*, a common heart condition of an irregular heartbeat. The intervening conditions may be, for example, conditions of access to the Internet, familiarity with social media, facility in using computers, and so on. The causal condition may be that the person concerned suffers from this condition and wishes to keep informed about developments in

treatment, side effects of prescribed drugs, and potentially successful operations. The consequences would remain to be found, of course, but we can suppose that the person feels better informed as a result of the searching, that he or she signs up to mailing lists to continue to receive information, and that previous feelings of anxiety about the condition are relieved. With the aid of this paradigm, the codes developed in the analysis of the data can be assigned to the relevant aspect of the phenomenon.

Theoretical coding and writing *memos* about the emerging relationships among concepts, takes the development of theory further. According to Glaser,

> *"Theoretical codes implicitly conceptualize how the substantive codes will relate to each other as interrelated multivariate hypotheses in accounting for resolving the main concern" (Glaser, 1998, p. 163).*

or, in simpler terms, a *theoretical* code brings together a number of initial codes into a concept that will be useful for theory development.

We can illustrate the idea by reference to another hypothetical example: suppose the researcher has studied the behaviour of people using a prototype organizational intranet and one of the aspects studied is the person's evaluation of the search interface. In the interview transcripts, the researcher has identified codes such as, "problem locating cursor", "lack of contrast", "unfriendly", "too many steps", and "dead link", all of which may be aggregated within the theoretical code "usability". The concept of usability then becomes one of the theoretical concepts used in theory construction.

The grounded theory approach is not the only approach to the development of theory. In the physical sciences, for example, experimentation is not simply a means for testing theory, but also for generating theory. In certain cases within the social sciences, particularly psychology and social psychology, the experimental approach is also frequently used, and where appropriate, can be adapted to research into information behaviour.

Consider, for example, the proposition of the evolutionary psychologists that one of our neural networks has evolved to be triggered if there is the possibility of physical harm. We may tentatively evolve a theory to the effect that, if this module (or network) is activated, a person's search for relevant information will be more focused and more thorough than otherwise.

We can devise an experiment to determine whether or not this is the case: we assemble two groups of people, a control group and an experimental group. The experimental group is shown a film in which home-owners and their children are threatened by two armed men who break into their home to rob them. The control group receives no such stimulation.

Both groups are then asked to search for information on domestic security systems and to report back on the options and a potential 'best buy'. Our theoretical hypothesis is that members of the group whose self-preservation module has been triggered by the film will conduct more thorough searches, discover more about security systems and perhaps come up with more alternative 'best buys' than members of the control group.

If this theory is validated by the experimental results, we are on our way to evolving an evolutionary psychology theory of information

behaviour, and we can go on to test the impact of the other evolutionary modules in similar ways.

The idea of this kind of experiment may seem novel in information science but it is quite common in psychology; see, for example, the rather amusing study by Sundie et al. (2011) on the impact of the 'mate-attraction' module: the authors concluded:

> *The present experiments demonstrate that the motivation to conspicuously consume and display, to the extent that it is evoked by a mating context, may be most prominent among men pursuing a sexual strategy that involves low parental investment. Conspicuous consumption was pronounced among men interested in short-term mating liaisons and was perceived accordingly by women.* (p. 677)

General theory

The theories produced by the grounded theory approach are of the kind described by Merton (1949) as 'middle-range' and defined as,

> *theories that lie between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behavior, social organization, and social change. (p. 39)*

In his essay, Merton contrasts middle-range theories with general theories of sociology, referring to Marx, Sorokin and Parsons. Today there is little reference to Sorokin, but Parsons and Marx are still cited, and Giddens's structuration theory (1986) may be seen as a more recent general social theory.

When one searches for information on general theories, it is, almost inevitably, Einstein's general theory of relativity that tops the search output. Needless to say, I do not have anything quite so revolutionary in mind when I use the term.

Mahoney (2004), writing on general theory in historical sociology notes,

> *A lack of consensus concerning the meaning of general theory has characterized the debate over general theory (p.460)*

and he proposes that,

> *general theories identify particular "causal agents" (i.e., basic units of analysis) and particular "causal mechanisms" (i.e., abstract properties of causal agents that produce outcomes and associations) (p. 460).*

He further notes that, in general theories, the causal mechanisms cannot be observed and that they exist '*outside specific spatial and temporal boundaries'*.

If we accept Mahoney's definition of a general theory, then it would seem possible to construct a general theory of human interaction with information. We have seen in the earlier part of this chapter that middle range theories have been proposed, dealing with information need, the role of feelings, modes of information use, and so on. The question then arises, what would a general theory look like?

A general theory of human interaction with information

Given what has been said so far about the link between models and theories it is probably evident by now that I consider that the models I have proposed are models of a general theory of human interaction with information (see Wilson, 2016). I have not previously proposed that the models represent a theory, but other writers have done so, at least implicitly, and sometimes directly. For example, an anonymous contributor to Wikipedia uses the phrase 'Wilson's theory of information behaviour' (Information..., 2015), Ford (2004, p. 770) refers to 'Wilson's theoretical model', Vakkari (2001, p. 44) writes of Wilson's contribution to 'theoretical and empirical bodies of knowledge', and Beaulieu (2003, p. 243) comments on 'Wilson's... theoretical general model' and, most recently, Watters and Ziegler (2016, p. 269), note, '*Wilson's theory of information behaviour is widely recognised as integrating multiple disciplinary perspectives, including psychology, management and communications theory...*'.

These citations suggest that the models are recognized as diagrammatic representations of a theory. This point is important, since the models themselves, as Sutton and Staw (1995) note, do not constitute theory, rather, theory is needed to explain the function and operation of the models.

If we take the fairly well established categorisation of a) positivist or hypothetico-deductive, b) inductive (constructivist or interpretative) and c) critical theory, it is clear that this theory falls into category b), in that it was, in large part, derived inductively from the research undertaken within the INISS project (Wilson and Streatfield, 1977; 1980; Wilson, Streatfield and Mullings, 1979).

Considering other approaches to the nature of theory, this general theory can be characterised as behavioural, in that it uses the wide range of concepts used in the behavioural sciences, in which human behaviour is explored from many directions, psychological, social psychological, sociological, economic and political. The rather curious idea has arisen that the models represent a cognitive theory, but an examination of the models easily demonstrates that this is not the case. From the beginning, these models have identified a wide range of factors from the psychological to the social that influence the behaviour of individuals in relation to information. The cognitive approach, on the other hand, implies a focus on the *meaning* that information has for the information user, and the shared understanding of that information with others in the same situation (Wilson, 1984).

Characteristics of theories

The conditions that must be met by a theory have been set out by Dubin (1978), who argues that a theory contains four essential elements:

> first, it must include the factors relevant to the area of interest;
> secondly, it must show how those factors are related;
> thirdly, it must state why these factors and relationships are appropriate for the purpose claimed; and
> finally, it must include an indication of the contextual limitations of the theory.

One might add that, the more general the theory, the less likely are contextual limitations to arise, although in relation to human interaction with information it is likely that geographical limitations may apply; for example, the information resources available in, say, Northern Nigeria, are likely to be different from those available in central London or in Boston, Mass. Similarly, if we are considering the role of technology, it is likely that the nature of the technology and its distribution will change over time.

Considering the proposed general theory from this perspective, it does identify a variety of factors, and categories of factors, that affect a person's behaviour relative to information. For example, Figure 5.2 suggests that personal characteristics, social characteristics, and environmental factors are all likely to be involved in the development of the initial need for information. The diagram identifies the work environment, the socio-cultural environment, the politico-economic environment, and the physical environment as contextual factors affecting the emergence of information needs. These factors are also identified as potential sources of barriers to information seeking. Thus, the theory appears to satisfy Dubin's first condition.

Regarding the second condition, the theory shows how various factors are related one to another. Thus, the context in which the information need is expressed gives rise to actions to satisfy the need, unless (as the notion of intervening variables makes clear) circumstances exist or arise to prevent or inhibit those actions. This gives rise to the idea of barriers to information seeking behaviour, and examples of such barriers are provided in the models.

The third condition is that a theory must state why the factors and relationships established by the theory are appropriate for the purpose claimed. Throughout the discussion of the models, both here and in the earlier papers, the choice of theoretical concepts is justified by reference to the fieldwork through which the models were generated; thus, it is precisely because the theory is grounded in empirical research that the theoretical concepts chosen are appropriate to the study of human information behaviour.

Finally, the theory clearly indicates the contextual limits, precisely through its locating the emergence of information needs in the situational context of the individual. Thus, as noted earlier, although the theory as a whole may be usefully employed in different situations, the contextual factors must be taken into account in order to explain differences in behaviour in different settings, cultures, economic conditions, political limitations, and so on.

Further characteristics of theories

Authors from different schools or disciplines identify different characteristics or functions implied by the term. In another information-related field, information systems, Gregor (2006) suggests that the key characteristics of theory are generalisation, causality, explanation and prediction, but these are the typical characteristics of a positivist approach, setting the same conditions as for scientific theories. Even within the social sciences different disciplines are likely to have schools of thought, often based upon the work of some earlier theorist, that present different views of the nature of theory: for example, followers of Marx, Weber, Parsons, Habermas,

Adorno and Heidegger are likely to have diverse explanations for whatever regularities in social behaviour they are interested in.

However, if we examine the proposed theory from Gregor's perspective, what do we find?

Generalisation

Generalisation suggests that the theory finds wide application across space and time in a diverse range of contexts. In this respect, it is notable that the theory has been employed by researchers across many different countries, with different categories of information user, e.g., to name some recent examples, politicians (Demaj and Summermatter, 2012) family historians (Darby and Clough, 2013) veterinary researchers (Nel and Fourie, 2016) and distance learners (Tury, Robinson and Bawden, 2015), and over a considerable period of time. In adopting the theory, Tury et al. (2015, p. 314) note:

> *This model was chosen because it is comprehensive, applicable to various contents, roles and disciplines, and is well established in the field… It also includes the concept of 'intervening variables' that can enhance or hinder the whole process of information-seeking behaviour, including acquisition and use... It has also shown itself sufficiently flexible to be extended into new contexts...*

Thus, although the model representations of the theory predate the arrival of the personal, desktop computer, and even more the arrival of portable computing devices, the models have been used in settings where a main area of interest has been the use of computers for information searching (e.g., Kim, 2008; Joseph, Debowski and Goldschmidt, 2013; Miwa and Takahashi, 2008; Harlan, Bruce and Lupton, 2014).

Causality

Causality is very complex from ontological and epistemological points of view (for an analysis, see Brady, 2011), and social scientists are probably more comfortable in talking about correlation and association. In phenomenology, Schutz (1976, p. 231) refers to causal adequacy, noting that, '*A sequence of events is causally adequate to the degree that experience teaches us that it will probably happen again*', which is a far looser definition of causality than for pure science, where the aim is to discover, definitely, that A is the result of B, although even in the sciences probabilities play a role in the search for answers to intractable research questions.

In the case of the proposed theory the situational context of the individual gives rise to circumstances that require a search for information. This applies in what has come to be called the 'everyday-life world', as well as the world of work or of social relations. For example, it is probable that an individual in search of a new apartment will experience a need to seek information on available properties, prices, locations, and so on. If the researcher observes that this happens with some regularity, we can suggest that the motivation is a causally adequate explanation for the resultant actions.

The more general socio-politico-economic environment presents either aids or barriers to the need to engage in a search for information, causing the individual either to persist in the search, or to

abandon it. In the actual search process, other factors may aid or limit the person's actions: thus, in seeking, for example, medical information on a disease or on an intended surgical operation, a lay person may be ill-prepared to read scientific papers on the subject, but able to understand information provided on Websites intended for the patient, rather than for the medical practitioner. A variety of hypotheses can be derived from the models to explore causal relationships further, relating, for example, educational level, age, sex, social class, 'self-efficacy', and other variables, to success or failure in finding needed information.

Explanation

Brady's (2011) analysis of causality and explanation in the social sciences links the two concepts tightly. Clearly, we understand how and why things happen when we are able to identify the causes of behaviour. The proposed theory is aided in this by the adoption of theoretical concepts from other fields: thus, stress/coping, risk/reward, and self-efficacy are explanatory concepts in the chain from the arousal of need to its satisfaction through search.

Timelessness

Gregor's set of characteristics by no means exhausts the possibilities: a theory is not limited in its application to a particular point in time. This can be illustrated by the fact that in one of the models, the idea of the mediator is introduced, i.e., someone acting for a person in the information search process. At the time, only human mediators existed, in the form, for example, of reference librarians able to perform searches on behalf of people. Subsequently, software agents (see, e.g., Voorhees, 1994; Wooldridge and Jennings, 1995) have been developed which take on at least some of the role of the human intermediary in the performance of information-related tasks. However, it is not necessary to revise the diagrammatic model, since the term mediator can stand for either the human or the computer equivalent.

Similarly, social media are a relatively recent development, certainly post-dating the 1981 models. Social media may be employed to discover information or exchange information or even publish information: in other words, they may constitute an information resource and can be simply added to any existing typology of such sources. Social media can also be considered as information exchange or information sharing agencies.

Hypothesis generation

Hypothesis generation is also viewed as a characteristic of a theory, particularly, of course in the case of the hypothetico-deductive theories of pure science. Such theories are capable of such things as mathematical modelling and statistical proof, whereas in the social sciences, the hypotheses have a rather more modest aim of presenting alternative explanations for phenomena. The proposed theory, as expressed in the various models, can certainly be used to generate hypotheses. For example, if we look at Figure 3.4, it is a relatively straightforward matter to develop hypotheses from the theory implicit in the model. For example, the figure postulates that information needs arise out of the more fundamental physiological, affective and cognitive needs of the individual and that these needs are determined

by their personality, the role they occupy and the environment within which they operate. Consequently, hypotheses could include:

- Persons occupying different work roles in the same organization, will experience different needs for information relating to that role.
- Persons in the same work role in different politico-economic environments, will experience different needs for information relating to that role.

Turning to the expanded model of Figure 4.7, stress is posited as an activating mechanism for information seeking. That is, that the perceived significance of having the information and the consequent psychological stress of not having the information determines whether or not the person decides to seek information. Thus, the hypothesis can be formed:

- The perceived level of stress experienced by the person as a consequence of not having the necessary information will determine whether or not s/he sets out to find information.

Clearly, many more hypotheses can be general by an imaginative analysis of the models and the underlying theory, and it is evident that the term theory can be applied to the underlying ideas of the models. Of course, operationalising the theoretical concepts so that the hypotheses can be explored and tested is another matter, but in some cases surrogates can be found. For example, measuring a concept such as psychological stress is extremely difficult, but a surrogate might be the importance the person attaches to finding the necessary information: the more important the information is (to the completion of a task, for example), the more stress will be perceived if the information is not forthcoming. The operationalisation of concepts and the demonstration that specific surrogates are satisfactory alternatives is a matter for the individual researcher using the theory.

Hospitality

A general theory will also be hospitable to models derived for different aspects of information behaviour, enabling the application of the theory to specific cases. Thus, for example, the well-known model of the information seeking behaviour of professionals, proposed by Leckie, Pettigrew and Sylvain (1996) can be readily incorporated into the general theory. Leckie et al., focus on the task performance of professionals, seeing the context of information need in the work role and specific task characteristics. Figure 3.4 identifies work role as one of the contexts of information need, along with the performance level of that role, and the concept of task characteristics used by Leckie et al., can be seen as an elaboration of role. Similarly, their awareness of information can be included in the model as a useful intervening variable to be included in the general theory.

As another example, we can consider Savolainen's everyday life information seeking model. From the perspective of the Wilson's general theory, everyday life, is simply one of the contexts within which information needs arise, and the projects of life and problematic situations, are those conditions that give rise to specific needs. The concept of mastery of life, might be considered an activating mechanism, since, if I understand the paper correctly, the different modes of mastery will result in different modes of dealing with problems. Savolainen's situational factors (lack of time is given

as an example), would constitute an elaboration of the intervening variables, as would the concepts of material, social and cultural and cognitive capital.

Thus, the theory is hospitable to concepts drawn from other models which can be drawn upon to add richness to and expand the theory.

Conclusion

That the models discussed in Chapter 3 and 4 are representations of an underlying theory seems incontrovertible: it has been shown that they have been used as the theoretical underpinning for research and that the underlying concepts pass the test, when tested against well-known characteristics of theory. That the models have proved useful to researchers over the past forty-years is also testimony to their theoretical nature. The fact of their generality is also strong evidence of a theoretical basis, originating at a time before the mass use of computers, they nevertheless apply equally to computer-aided information seeking as to the manual searches common at the time of their origin.

Think about it

1. Consider some significant event in your own life: what happened and how did it come about? What theory(ies) do you have about the causes?
2. At the end of Chapter 4 it was suggested that you construct a diagrammatic model of some part of your own information behaviour. Now consider the various theories explored in this chapter and determine which best fits your model.
3. The dissemination of ‘fake news’ has become a significant feature of social media: how would you begin to theorise about the motivations of those who disseminate such news?

Researching information behaviour

Research methods for exploring information behaviour.

6

Researching information behaviour

Outline

Introduction

Whether we are testing theory or developing theory, we are involved in a process. The process may vary depending on the nature of the project: thus, a PhD project has specific requirements to fulfil, set out by the university's regulations and, perhaps, to a degree, suggested by supervisors. An externally-funded project, on the other hand, may not be bound by as many local regulations, but must satisfy the ethics committee of the university and must deliver its results on time and to budget. PhD projects are also time-bound, but there is usually some flexibility if external factors result in a necessary shift in the timescale. A local project, perhaps undertaken by a library to discover the satisfaction of users with the services offered, has different objectives. For example, the study might be undertaken to evaluate an experimental service, or to determine satisfaction with the way e-books are currently accessible to users. Here, the aims are purely pragmatic, rather than theoretical, but, nevertheless, theory may provide a useful guide for the conduct of the research.

Here, we are concerned with *academic* or *scholarly* research, which embraces the academic dissertation at all levels and funded research projects.

The research process

The differences between research for the academic dissertation and funded research usually occur at the beginning and end of the process, but the actual research activities are relatively common.
Research projects are usually undertaken as a result of getting financial support from a funding agency, through a process of

competitive bidding. PhD research, on the other hand, may be funded by the person themselves, or by a government or agency sponsor. In the latter case, a process of competitive bidding might also be involved.

The nature of research projects is usually determined by the objectives of the funding agency: thus, many European Union calls for proposals are looking for what they term 'close to market' ideas, that is, they are more in the nature of research *and development* projects, than pure research projects. The European Research Council, however, supports only leading-edge or *blue sky* scientific research. The national research councils in various countries may fund a combination of pure and applied research in the different disciplines.

At the end of the process, the PhD candidate must produce a thesis and satisfy the examiners before the degree is awarded. How funded projects end depends upon the requirements of the funding agency: some research councils ask for a final report, detailing the research outcomes and presenting a financial statement on how the money has been used, while others may ask for copies of published papers and the financial statement only.

Between the beginning and the end, however, there are many similarities.

1. Formulate the research problem: this will have been done already, in the case of the funded research project, since it will have been necessary in preparing the research proposal. The PhD student may also arrive at the beginning of the process with a firm idea of what he or she wishes to do. If the PhD project is associated with a funded project, the PhD topic may already have been decided by the research team.
2. Carry out the literature review: again, in the case of funded research projects this will have been done, at least to some extent, in preparing the proposal, but further work may be needed once the project is under way. For doctoral research, of course, this is a major task. The review should focus not only on the research topic and the extent to which it has been investigated already, but must also pay attention to relevant theories and methods. Note that 1 and 2 may be iterative; that is, a review of the literature may reveal that there is little room for further investigation of the topic, or that the question one had imagined as interesting, turns out not to be interesting and, consequently, the topic has to be changed.
3. Specify the research questions and/or research hypotheses: at this stage one must decide what research approach is to be adopted, i.e., qualitative or quantitative, positivist or interpretative. The positivist approach involves the identification of hypotheses to be tested; while the interpretative approach generally involves setting out research questions that do not take the form of hypotheses. Thus, in positivist research, we already have a good idea (from the results of previous research) how variables in a situation may be related. We can, therefore, set out our research question in the form of a *null hypothesis*, for example:

H1. There will be no difference by discipline in the use of e-books by undergraduates for study purposes.

We expect, of course, that there will be a difference, and hope that the data we collect will reveal the differences.

The qualitative (or interpretative) research question will be rather less formalised, asking, for example:

RQ1. What differences are there in the use of e-books by undergraduates in different disciplines, by year of study, and by sex?

Here, the qualitative researcher is acknowledging that s/he lacks information that would enable the formulation of hypotheses, and it is clear that, depending upon the results, hypotheses *could* be formulated and tested quantitatively in further research.

4. Determine the research strategy: that is, how do you intend to carry out the research? This may involve gaining access to organizations and seeking permission to carry out interviews; determining how many people are to be interviewed or surveyed; satisfying the ethics committee about personal data, permissions, and so forth; how the data are to be analysed; what is the timetable; what resources are required; and probably more. In other words, this stage is a non-trivial task and often takes longer than planned for.
5. Deciding the data collection method: *data collection* is rather a misnomer, as, if the research is interpretative, one is gathering information and evidence, rather than the data elements typical of quantitative research. The next section will be concerned with methods generally and here we can simply acknowledge that the two approaches involve different data (or information or evidence) collection methods.
6. Determining the data (evidence) analysis method: this will vary according to the research method. Quantitative analysis involves statistics and, fortunately, programs are available to assist in this, the most common of which is SPSS (Statistical Package for the Social Sciences). Qualitative research involves the analysis, through coding, of the large bodies of text resulting from interviews, field notes, organizational documentation and other sources. Again, programs are available: Atlas.ti and NVivo are probably the most commonly used, but others are available. One point to note is that the analysis of quantitative data can be done much more quickly than the analysis of qualitative data.
7. Interpreting the data or evidence: this stage is often omitted from lists of research stages, although it is sometimes incorporated into the analysis stage. It is useful, however, to think of it as a separate phase, since mere analysis will not answer the questions posed. Once we have carried out our analysis the question remains, What do the data mean? That is, how do they relate to our hypotheses or research questions? To what extent do they support or refute our hypotheses? Do we have sufficient information to answer our initial questions and formulate a tentative theory?
8. Report or thesis writing: ultimately, the stage is reached at which we have to report on our findings to the funding agency for the project, or complete our thesis. It may be possible, in either case, to submit a number of articles that have been written in the course of the project, or the PhD programme, together with an introduction and summary that ties the papers together. Many guides to report writing are available on the Web, as this Google search shows. There are also published guides to thesis writing, for example, Joyner, Rouse and Glatthorn (2018), as well as much briefer online guides, for example, Writing a dissertation or How to write a thesis. Above all, however, you need to observe the requirements of the university as set out in its regulations.
9. Disseminate your work: this stage is also often forgotten, but, if the research is of interest to a wider audience than the funding agency or the PhD student, it deserves to be disseminated by means other

than the research report or the thesis. In many cases, of course, a research team will have been publishing during the course of the project, and some universities permit the production of the PhD through the compilation of already published papers, but if this has not been the case, the team or the thesis author will want to publish papers in the journals of the field, and/or at relevant conferences. Given what has been said about the inter-disciplinary nature of information behaviour research, it may be at least as appropriate to publish in the field to which the research relates as to publish in information science journals.

The available methods

The usual division of research methods is into quantitative (associated with a positivist perspective) and qualitative (associated with the interpretative view). However, this division is not very satisfactory from a theoretical perspective; that is, what makes an approach quantitative or qualitative? We can understand that *quantity* involves numbers, but what is involved in *quality*?

One possible answer to this is to construct a typology, based on the characteristics of research in general. I start from the point that all research methods are based, ultimately, upon *observation.* This has been the principal way of discovering the nature of our environment, ever since Homo Sapiens emerged, and is the original method of science. Thus, astronomy began with our unaided observation of the sky and only with the invention of the telescope became more detailed, but still observed directly, by the human eye. Now various instruments are used to observe the universe, such as radio telescopes, spectroscopes, and high-definition cameras. These instruments are a means for the human to indirectly observe astronomical phenomena, since, for example, we have no sense organ that can receive and interpret radio waves. Observation, then, can be categorised as direct or indirect, and indirect observation may be reported, as when an interview respondent is asked to report upon their own information-seeking behaviour; or recorded, as when an instrument produces a record of the observations it is making.

The research methods that follow from direct or indirect observation may then be categorised according to the extent to which they are structured. Thus, the social anthropologist, exploring the social norms and mores of a remote New Guinea tribe, engages in a form of observation generally described as participant observation, or ethnographic observation, making notes on the tribe's activities, their story-telling, raiding activities, and so on. He or she does so having, perhaps, only a minimal structure through which to organize the data. For example, imagining that there will be courtship rituals, coming of age rituals, gift exchange, and so on, but having to produce a much more detailed structure from the observational data.

On the other hand, we can refer to Mintzberg's (1973) study of managerial work, which involved structured observation, that is, the collection of data with a previously determined structure. Mintzberg's method was adopted for the INISS project (Wilson and Streatfield, 1980) and the structure imposed in that study consisted of *Time of the communication event, Source and receiver of the communication, Channel of communication, Medium of communication*, and *Location of event.* Field notes were also recorded for each event and, following the observation period, further categories were developed, i.e., *Activity engaged in while communicating, Response to the communication*, and *Purpose of the communication*.

As indicated by both of these examples, the division between structured and unstructured is not absolute: some degree of structure must always be imposed, because we should always be able to say, to some extent, what we are looking for. However, as the INISS example shows, even when a high degree of structure is imposed, there is still room for additional elements of structure to *emerge*. Therefore, I name the categories, *imposed structure* and *emergent structure*.

Our typology now takes the form of Figure 6.1 with examples of methods for each category. Clearly, the examples shown do not exhaust the possibilities, and we can now look briefly at the full

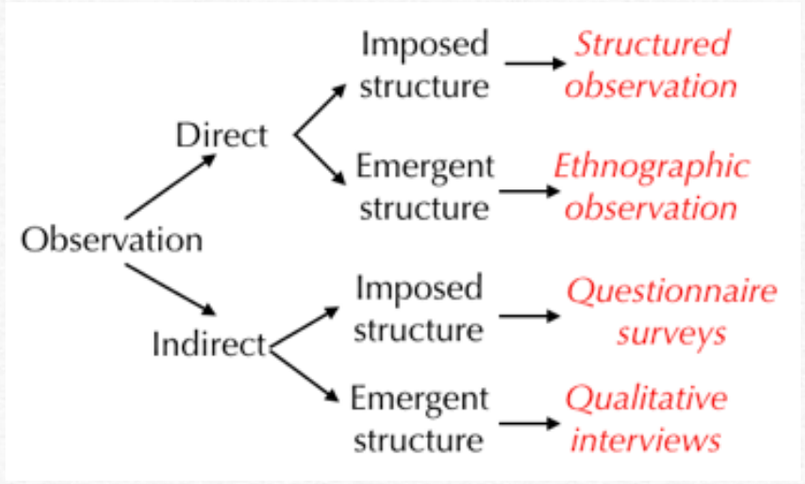


Figure 6.1 A typology of research methods

range of methods. It is not the object here to give detailed descriptions of the methods, but simply to show the range of possibilities.

Direct observation

Looking first at the direct observation, imposed structure category, we can include laboratory experiments with a human observer. Such experiments have been relatively little-used in information behaviour research, but some examples exist from early work on information seeking in the field of psychology. For example, Wheeler (1964) demonstrated that, where a power discrepancy exists between members of a dyad, the low-power member will seek more information about the high-power member, in an attempt to equalise the power discrepancy. In another experimental study, Lanzetta and Kanareff (1962), found that putting a cost on information reduced the extent to which their subjects were prepared to search for information. Instead, they spent more time analysing and interpreting the information they had been given.

Structured observation has not been widely employed in information behaviour research, since the INISS project referred to earlier. The reason for this is, most likely, the cost of having observers in the field. It is feasible on a small scale however, and some investigators have employed the method. For example, Hyldegård, Hertzum and Hanset (2015) used it in a comparison of three methods of data collection for research into collaborative information seeking. Also, an unusual application is that by Liao, Pan, Zhou and Ma (2010), who hired research assistants to observe the activity on Websites.

Ethnographic or participant observation tends to be employed as part of doctoral research, since it requires the involvement of only a single researcher. Through participating in the activities of a group or organization, the researcher acquires direct understanding of the causes and problems of information seeking in a specific context.

While not widely employed in information science, some examples do exist, and it seems that the method has been used particularly in the health information sector. For example, Namuleme (2015) used it in a study of people affected by HIV/AIDS, collecting data while working as a volunteer for a year in a support centre.

Indirect observation

The term *indirect observation* is used to signify that the researcher is relying upon reported or recorded information on the research questions, rather than being able to directly observe the person's behaviour.

In Figure 6.1, questionnaire surveys are shown as the typical method, but of course, others exist, particularly as a result of technological developments. The area can be expanded to show the multiplicity of methods as follows:

- Indirect observation
  - Imposed structure
    - Questionnaire survey
      - Mailed
      - Online
        - Text only
        - Decoratively visual
        - Functionally visual
        - 'Gamified'
    - Structured interviews
    - Log files
    - Eye-tracking
  - Emergent structure
    - In-depth or qualitative interviewing
    - Group interviews (Focus groups)
    - Content analysis

This is not a text on research methods and, therefore, we cannot offer detailed instructions on conducting the different modes of data collection. We can only deal with the main points that apply to any of the methods.

Imposed structure

The key point for *imposed structure* methods (other than log files and eye-tracking) is that the researcher must already know a great deal about the problem area and/or be guided by relevant theory and previous research, to be able to ask the right kind of questions. Even in the case of *emergent structure* methods, such as qualitative interviewing, the researcher needs at least some structure to refer to, if only in the sense of very general question topics. The structure of log files and eye-tracking are, to a degree, imposed by the technology, although human decisions lie behind the activities logged and the design of the Web pages tracked by the human eye.

A further point is that, if the design of questionnaires and structured interviews involves many *closed* questions, that is, those offering a set of responses from which the respondent selects the appropriate response, the researcher must be very sure that the range of responses is as complete as possible and must always offer an '*other*' category, to allow for responses of which the researcher is unaware.

The use of questionnaires mailed to respondents (or, for example, distributed within an organization) has been a traditional method ever since the invention of surveys. However, the arrival of the Internet and the World Wide Web, along with e-mail, wikis, and other

technologies, has led to the rise of the online questionnaire as a common data collection instrument.

Downes-Le Guin, Baker, Mechling and Ruyle (2012) devised a typology of online questionnaires, identifying four types: text only, decoratively visual, functionally visual, and gamified. Text-only presentation is the usual type for both mailed and online questionnaires, and both forms may also use the decoratively visual type, where icons may be used to provide an additional signifier for a response category, such as an image of a motor-car to identify car manufacturers. The functionally visual type is restricted to online questionnaires, since it requires the use of such elements as slider-bars which the respondent can move with a mouse to select their responses. A 'gamified' questionnaire is one that uses elements of online gaming as the respondent moves through the questionnaire; for example, by immersing the questionnaire items in a game in which respondents are rewarded with the acquisition of weapons or other rewards as they progress through the stages of the questionnaire.

Following a test of the four different types of questionnaire, the authors concluded:

> *Based on the results of this study we conclude that the keys to greater survey engagement lie not in graphical enhancements or greater interactivity in the presentation of survey questions, but rather in dealing more effectively with the fundamental components of respondent burden that survey methodologists have long recognised: survey length, topic salience, cognitive burden (i.e. poorly written or hard to answer questions) and frequency of survey requests. (p. 630)*

They found that the gamified version of the questionnaire resulted in the fewest fully completed responses. Given that the cheapest type to produce will obviously be the text only version and that the functionally visual and gamified versions will be the most expensive, it is clear that for the vast majority of cases, the simplest form, assuming that it is well-prepared, will suffice.

The structured interview employs an *interview schedule*, similar to the self-completed questionnaire, but having the possibility of including more open questions to solicit additional information from the respondent. The big advantage of the structured interview is that the interviewer can use probes and prompts to get more information on a particular topic from the respondent. Such probes and prompts must always be *non-directive*, i.e., they should not suggest a possible answer to a question, but should take a neutral form, such as *Is there anything else? Could you explain what you mean by...? Why is that?*

The advantage of the interview is that you can get more, and more accurate, information from a respondent: the disadvantage is that it is more costly, particularly if interviewers have to be employed.

A common variant of the face-to-face interview is the telephone interview, which has the advantage that no travel time to undertake the interview is required of either the interviewer or the respondent. The disadvantage, of course, is that there is no visual contact with the respondent and, as a result, the interview is unable to see non-verbal responses that would otherwise indicate the respondent's reaction to a question. That problem may be overcome, of course, by the use of facilities such as Skype or Facetime. A paper by Opdenakker (2006) reviews four methods of interviewing, including telephone interviews.

Log file analysis and eye-tracking are used for the analysis of what we might call *micro behaviour*, i.e., the use of computers in searching for information. Log file analysis has been used mainly in research into Web searching behaviour, as in the case of Spink, Bateman and Jansen's (1999) early study of users of the EXCITE search engine. The kinds of research questions that can be asked using this method of data collection depends critically upon how the system is set up to log users' actions and inputs. In the case of search engines, the researcher is limited by what the company has decided to log, but with experimental research, the system can be set up to log *all* activities and inputs. The paper by Nicholas, Huntington, Lievesley and Withey (1999), on the analysis of log files of *The Times* and *The Sunday Times* Websites includes a useful review of the problems involved in using such data.

We might describe eye-tracking as even more micro than log file analysis, since it collects data on how the user's eyes move from area to area of a Web page and how long they remain focused on an area. Eye-tracking is not a new technology, having been used in studies of reading since the 19th century (Eye-tracking, 2018); however, with the rise of the Internet and the World Wide Web, it has obvious uses in discovering how people scan a Web page, what attracts their interest, how they move from one part of the page to another, which features attract attention, and so on. Appropriate hardware and software are needed to carry out eye-tracking experiments and a good example of their use is the report by Bojko (2006). There are a number of manufacturers of hardware and the associated software, such as Tobii, SMI, SR-Research, and Eyetech. An interesting account of the use of eye-tracking (and mouse tracking) in an information search task is provided by Chizari (2017).

Emergent structure

The methods I have described as indirectly observed, with an emergent structure, are usually said to be *qualitative* methods, used to explore phenomena from the perspective of the participant in the research, with a view to determining what their behaviour means to them, and how they understand their own activities. Of course, that fact that we begin with some research intention means that some initial structure is imposed by the researcher, but that structure is generally quite limited and the intention is to discover how the phenomenon is structured in the minds of the participants.

The most commonly used of these methods is *in-depth* or *qualitative* interviewing. Here, the researcher usually begins with a small number of initial questions, usually referred to as an *interview guide*. For example, the researcher, investigating information behaviour in a workplace, may ask:

> *To begin with, when you have a work-related problem, how do you go about solving it?*

The researcher may then ask subsidiary questions, prompted by what the respondent has said, or may probe for further information by using non-directive probes, such as *Can you tell me more about that?* Thus, the interview proceeds more as a kind of natural conversation than in the case of the structured interview. However, effective in-depth interviewing of this kind means that the interviewer must have extensive background knowledge of the respondent's situation so that

the probes can relate to the context of information seeking. For example, if the interview is being conducted in a pharmaceutical company, the interviewer should have knowledge of the company, its products, its markets, the role of research in product development process, and the statutory requirements that must be met before a product comes to the market. Without this kind of knowledge, the interviewer is going 'blind' into the interview and will be unable fully to understand the responses, or to probe for further information.

Usually, in-depth interviews are recorded, but the researcher would be well-advised to take verbatim notes in addition, since the technology can fail and, if no notes are taken, that particular interview has been lost. I speak from experience: on one occasion I interviewed an IT director in a pub in London and taking verbatim notes was physically impossible, so I relied on the recorder, only to discover when I turned it on to start transcribing, that nothing had been recorded!

Group interviews follow a similar process, but involve the interviewer and more than one respondent. Ideally, the interviewer should have an assistant to take notes and, like the interviewer, watch for participants who are not contributing, so that they can be asked questions directly. Sometimes, any group interview is referred to as a *focus group interview*, but *focus groups* arose as a market-research method, with the idea of focusing on customers' perceptions of a particular product or brand. They are now much used in political research, with a focus on specific social problems or party manifesto details. Group interviews, however, generally range more widely over a given problem area and lack a specific focus of the true focus group interview.

Content analysis has been described as being on the borderline of qualitative and quantitative methods (Duriau, Reger and Pfarrer, 2007) because some modes of content analysis rely upon techniques such as word frequency counting and word-co-occurrence. Certain text-mining techniques, such as topic modelling, also have a quantitative basis. Christoforidis, Heuwing and Mandl (2017) describe topic modelling as:

> *a set of algorithms which help to analyse a large collection of documents based on its latent thematic structure. The most frequently used technique LDA (Latent Dirichlet Allocation) assumes that every document in the collection is generated from a fixed number of topics, each document exhibiting a different proportion of each topic.* (p.39)

To go beyond the quantitative level of analysis, however, some kind of coding process is usually involved and software such as Atlas.ti and NVivo may be used - indeed, the kind of analysis used in the grounded theory approach, is content analysis of in-depth interviews, documents, social media messages, and other forms of text.

Mixed methods

Qualitative and quantitative methods are based on different understandings of the world around us - different paradigms. The quantitative paradigm, usually referred to as positivism, assumes an objective reality independent of the observer, who neither influences,

nor is influenced by the matter under investigation. However, even in the sciences this notion has been challenged: in particle physics and quantum theory Heisenberg's *uncertainty principle* says that both the position and momentum of a particle cannot be measured with absolute precision. The more accurate one measure, say position, the less accurate the other.

Furthermore, at the quantum level, the act of observing can change the phenomenon being observed. This *observer effect* was confirmed in a study at the Weizmann Institute where there was not even a human observer, but an electronic device. The experiment showed that when the electronic observer was active, the particles behaved as particles, rather than as waves. (Quantum theory..., 1998).

Qualitative methods, on the other hand operate under the *interpretative paradigm*, where reality is taken to be socially constructed (Berger and Luckmann, 1968) and where the observer effect is even more obvious. For example, in conducting an interview our questions may cause the respondent to think about an issue that he or she may never have previously thought about. In a very real sense, the resulting response has been *constructed* through the questioning process.

Given this disparity between underlying paradigms it might be thought unwise to try to mix qualitative and quantitative methods in a research project. Bednarz (1985), for example, has argued that, the philosophical differences of the two major paradigms cannot be bridged and that if mixed methods are employed it should be within one paradigm or another.

Others, however, argue that one can adopt a different paradigm. Greene and Caracelli (2003), for example, note the emergence of two alternative paradigms supportive of a mixed methods approach. The first is *commonsense realism* proposed by Putnam (1990), which suggests that,

> *rather than accepting only the formal techniques prescribed by one of the competing paradigms, social enquirers can select multiple methods in support of the multiple sensemaking capacities of humans.* (Greene and Caracelli, 2003, p. 99)

The second approach, and perhaps the term paradigm is not really applicable, is the *pragmatic* approach; the essence of which is, 'Does it work?' The argument for the pragmatic approach is set out by Howe (1988, p. 11):

> *I will argue that a principle implicit in the incompatibilist's argument–that abstract paradigms should determine research methods in a one-way fashion–is untenable, and I will advance an alternative, pragmatic view: that paradigms must demonstrate their worth in terms of how they inform, and are informed by, research methods that are successfully employed. Given such a two-way relationship between methods and paradigms, paradigms are evaluated in terms of how well they square with the demands of research practice–and incompatibilism vanishes.*

Turning to the information behaviour literature, there seems to be a trend towards the use of mixed methods, although this appears to have peaked in 2017, according to a search on Web of Science for papers with *mixed methods* and *information behaviour* or *information seeking* as a topic. The papers do not always deal with the paradigm

issue, but one that does is Williamson's study of Australian online investors (2008). Williamson explains that:

> *The theoretical drive of the project was qualitative (interpretivist) with the quantitative data being used to provide the 'broad picture' of investing and information-seeking behaviour before an in-depth exploration of information-seeking issues in interviews. The two components were treated as separate, though related, with the underpinning philosophies being matched and respected: the positivist tradition in the case of the survey which provided the quantitative data; and an interpretivist paradigm (in this case constructivist) for the qualitative component.* (Williamson, 2008, The online investment study approach.)

The dominant argument for the adoption of mixed methods appears to be their complementary character: the qualitative approach adds depth to the findings of quantitative research. But one might also argue that with respect to underlying paradigms the methods, as such, are independent of paradigm and that relationship only becomes meaningful through their use. For example, it would be quite possible to carry out a large-scale questionnaire survey where all the questions were open and where the analysis of responses was carried out observing the tenets of the interpretative paradigm. It would be equally possible to engage in participative observation and to present the results in terms of frequency distributions of particular kinds of behaviour.

Doubtless, the argument regarding the paradigmatic status of quantitative and qualitative methods will continue, the only caveat one can enter is that, if you adopt a mixed methods approach, be sure you understand the consequences.

Participatory research

Most information behaviour research concerns research issues identified by academics or by PhD candidates, which are then pursued either with research teams on funded projects, or in the solitary doctoral candidate mode.

This is not the only model, however: the *consultancy* model applies when an organization approaches an individual researcher, or a department, seeking help with resolving a problem within the organization. The researcher may then carry out research in the organization, eventually reporting the results and recommendations to the person who commissioned the work. The work may become genuinely *participatory* if the researcher works with members of the organization in carrying out the investigation, analysing the data, and writing the report.

More generally, *participatory* research involves the researcher working with an organization, a community, or a group to identify the key research problem or problems, and then working with individuals in developing the research instruments, carrying out the research, and reporting. The members of the group or community are then partners in the research, with a stake in its outcomes, rather than 'subjects' or 'respondents'.

A recent example of participatory research in the archives field is that reported by Rolan et al. (2019), in which two academic researchers and '*five young care-leaver advocates*' participated in a project on the design of a record-keeping system relating to the

protection and out-of-home care of children. All seven participants are recorded as authors of the paper, who conclude:

> *We have greater understanding of the importance of being given voice and being heard. In many ways, this project has served to create an empowering space to explore how constructing and using your own knowledge can lead to a wide variety of personal, community, and sector transformation.* (Rolan, et al., 2019, Conclusion)

Action research

Action research is a specific mode of participatory research aimed at facilitating organizational change which was developed by Kurt Lewin in the USA. Lewin comments in respect of research on intergroup relations:

> *The research needed for social practice can best be characterized as research for social management or social engineering. It is a type of actlon-research, a comparative research on the conditions and effects of various forms of soclal action, and research leading to social action. Research that produces nothing but books will not suffice.* (Lewin, 1946, p. 35)

In collaboration with Lewin, staff at the newly formed Tavistock Institute in the UK further developed action research. The Institute appears to have put greater emphasis on learning as a guide to action than did Lewin:

> *Action research involves commitment to action and learning by all parties; the outputs are designed to establish evidence to support system learning and change. Action research helps clients take action which is informed by research and thoughtfulness.*
> (Tavistock Institute, n.d.)

Figure 6.2 shows a diagrammatic version of the action research process, indicating that the process may be repeated depending upon whether or not an answer to the organizational problem has been identified.

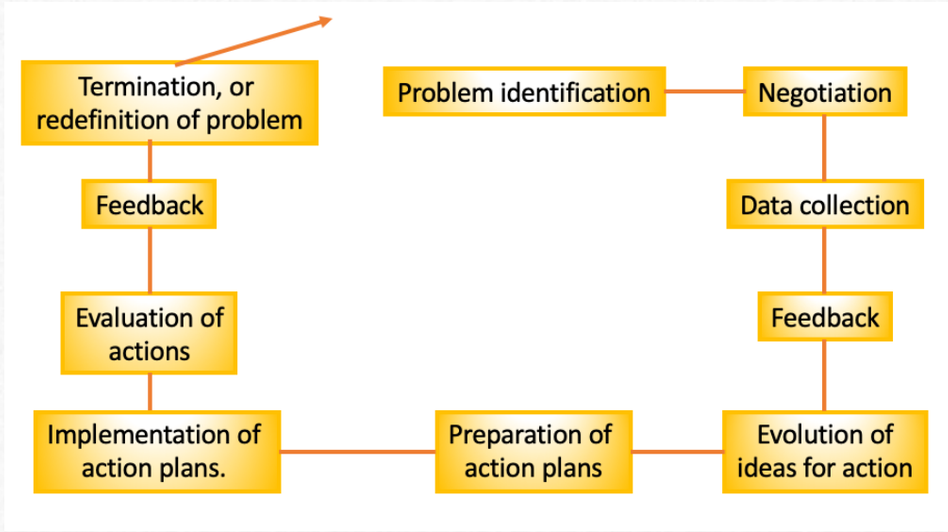


Figure 6.2 Action research (Wilson, 1980/2000)

Action research has been used comparatively rarely in information behaviour research, perhaps because organizations rarely think of collaborating with researchers in order to solve organizational problems. The INISS project (Wilson and Streatfield, 1980) was planned as an action research process, but the research problem was identified by the researchers and then negotiated with the organizations.

Following twenty-two person-weeks of observation in five departments, an interview survey was carried out with 151 staff members in four departments. The results were fed back to the organizations and discussions were held on the kind of information innovations that might prove useful and several innovations were implemented in a number of the organizations.

The INISS project cannot be described as an action research project in the sense generally understood by Lewin and the Tavistock Institute, but it had an action phase to it that resulted in changes to the management of information in the participating organizations.

A search on Scopus for papers on `"action research AND (information behaviour OR information seeking)"` revealed only twenty-two papers; however, one of these was the paper by Wilson already referred to and a further eleven did not report the use of action research in actual projects. This left nine papers to be examined and six of these had an educational setting; the remaining three were health-related. These two settings are probably very suited to the action research approach as innovation and change and the pressure to improve are constant.

As an example of the education-related papers, we can consider the study by Walton et al. (2018) in which the action phase consisted of workshops designed

> *to facilitate learners to be able to locate and evaluate information, paraphrase and also to be able to reference their sources...* (p. 300)

and the authors conclude that, '*By using a participatory approach, this research has shown that school students' engagement with information can be changed in very positive ways*' (p. 307).

The report by Decat et al. (2013) on the development of sexual and reproductive health interventions in Bolivia, Ecuador and Nicaragua, is an example of health-related work. The participatory action research mode involved focus groups and workshops including adolescents, health workers, social workers and others involved in providing sexual health care services. This was followed by interventions that took into account the cultural contexts revealed by the participatory data collection.

Given how powerful action research can be in achieving organizational and community change, it is rather surprising that it has not been employed to a greater extent by libraries and information services. One reason may be that, over recent years, much change has been the result of technology implementation, and commercial organizations have been the agents of change. It may also be that the relationship between organization and client is of a different order of complexity in health and education than in libraries and information services and, as a result, the need for action research is not apparent.

Research ethics

Today, most universities and colleges, and funding agencies, require ethical guidelines to be observed in the conduct of social research. This is partly to satisfy local legislation regarding the protection of personal data and, thereby, to protect those participating in the research, and partly to ensure the ethical quality of the research.

Common principles underlie research ethics guidelines and codes of practice:

first, the researcher must ensure that participants give their *informed consent* to participation in the research. That is, the participants must understand the purpose of the research, their place in the research, and how the data are to be used;

secondly, the researcher must observe all *legal obligations* in the country in which the research is carried out, especially as regards the confidentiality and security of the data obtained. In particular, the privacy of the individual must be respected.

The various codes of practice go well beyond these two basic principles but all address them in varying degrees of detail.

In addition to the guidance provided by universities (often available through their Websites, e.g., University of Birmingham, 2017; University of Michigan, 2019) various national and international bodies have produced codes of practice on research ethics. For example, the European Commission (2018) produced an ethical self-assessment guide for researchers bidding for funds under the Horizon 2020 programme. At the national level, the Swedish Research Council (Vetenskapsrådet, 2017) has a guide to Good research practice and the UK Research Integrity Office (2019) has a Code of Practice for Research, which includes a section on Research involving human participants, human material or personal data.

Similar codes of ethics are produced by scholarly associations, such as the Social Research Association's Ethical guidelines, (2003). Market research bodies also produce codes of practice for their members, such as the Market Research Society's Code of Conduct (2014).

The problems of ethical research in the digital age are discussed by Salganik (2018), who presents case studies of projects where the basic ethical consideration were *not* addressed. He identifies the basic problem as the, '*rapidly increasing power for researchers to observe and experiment on people without their consent or even awareness'* (p. 325). We can see evidence of this not only from the research cited by Salganik but also from the Cambridge Analytics case, where this company '*harvested from more than 50 million Facebook profiles without permission to build a system that could target US voters with personalised political advertisements based on their psychological profile'* (Greenfield, 2018).

Conclusion

This is not a text on research methods, and this chapter has only intended to present an outline of available methods of data collection. Before you get to this stage, however, you need to think very carefully about the kind of problem you wish to explore and your motives for doing so.

For example, you may be a university librarian interested to know why students use (or fail to use) the e-book resources provided by the library. Unless research has already been carried out on this topic elsewhere, and the results made publicly available, you are probably going to have to carry out qualitative interviewing of a sufficiently large sample of students to provide you with reliable information. In the 'grounded theory' approach you do this until *saturation* is reached, that is, until you are not learning anything new from the interviewees. You may not even publish anything about the

project, but simply use the information to influence your e-book access strategy.

Such a project, however, would not satisfy the requirements of academic research. If you were a PhD student interested in exploring the same problem you would need either to set your study within some existing theoretical framework, or work towards evolving a theory to explain the e-book-related behaviour of university students. In the latter case, your approach to data collection would probably be very similar to that of the university librarian described above.
If, on the other hand, a body of research exists, which you can mine for ideas, you might be able to construct a questionnaire, which could be used with a much larger sample of students, so that you can use a positivist approach to test a number of hypotheses about the factors that influence e-book use. Given the amount of time that is needed for effective analysis of qualitative data (transcribing a one-hour interview, for example, may take four or five hours), the positivist approach may be more time efficient!

Thus, *which* method to adopt for your research depends upon a number of factors: your fundamental methodological position *vis-á-vis* positivism vs. interpretativism; your research questions; the available resources to carry out the research; your available skills in terms of statistics, questionnaire design, interviewing techniques, and so on; the nature of the intended respondent group and its accessibility; and the level of information behaviour with which you are concerned, to mention only the main concerns.

Once you have decided upon an approach, there are many resources available to help you attain the necessary skill level to carry out the research. For example, on information research methods in general, Pickard (2013) is a very useful text, and for a general text that focuses on the digital environment, Salganik (2018) can be highly recommended.

For questionnaire design and question wording, there are many sources on the Web - simply search for *question wording* and you will find many from university and market research sources. However, one of the oldest and best guides is Payne's (1980) *The art of asking questions,* which I would regard as essential reading. Another older text, dating from 1966, still much used, frequently cited, and now revised, is Oppenheim's (1998) *Questionnaire design, interviewing and attitude measurement.*

If you use any form of attitude scale, for example, in seeking to discover attitudes towards seeking information on the Internet, these present specific problems, and there is probably no better guide than Oppenheim's book, mentioned above. Although here, as in any situation where statistical analysis is required, you will be well advised to seek expert advice. Many universities offer statistical advisory services for researchers.

When it comes to interviewing we need to distinguish between the more formally structured process and in-depth, or *qualitative*, interviewing. An excellent guide to the former can be found in a older, but still useful book, *The research interview,* edited by Brenner, Brown and Canter (1985). A more modern text, covering the full range of interviewing techniques is Gilham's (2005) *Research interviewing.*

Reading about conducting interviews, however, is only the second best method of becoming skilled: it is much better to undertake interviewer training, if it can be found locally. A two-day

experiential training workshop, involving video-filmed interviews of trainees and respondents with appropriate instruction and analysis by the trainer, is a very effective way of gaining the necessary skills.

Think about it

1. Your research project involves investigating the information behaviour of people with various levels of hearing disability. What difficulties do you envisage? Which data collection method would best deal with these difficulties?
2. What is your natural preference for your approach to research: are you inclined towards quantitative or qualitative methods? Why? Examine your motivations and consider whether they are likely to bias your choice of method.
3. Imagine that one of your research questions is: *What role do social media play in the information seeking behaviour of people diagnosed with cancer?* Set out the questions you would ask to collect information on this topic through structured interviewing.
4. Your research project is to discover how visitors use tourist information services. Outline a strategy for carrying out the work.
5. Examine any paper that employs a mixed methods strategy. How effectively is the question of the paradigmatic basis of the methods dealt with?

Using information behaviour research

How the results of research into information behaviour may be applied.

7

Using information behaviour research

Outline

Introduction

In any field of research the use to which findings may be put depends upon the relationship between the research and some field of practice. In some areas the relationship is obvious: for example, research into the design of new drugs has an obvious relationship to the treatment of disease; that is its intention. In other areas of what is generally called *pure* research–mathematics and particle physics come to mind–there may be no immediate connection with a field of practice and the aim is to advance research in those fields, not to deal with some practical problem. Even in these cases, however, practical applications may emerge, for example, developments in number theory have been applied in private key cryptography, used to ensure the security of online communications (Private-key cryptography, 2019), and the creation of devices of the detection of individual photons of light in particle physics research led to the development of positron emission tomography (PET scanners), used in medical diagnosis (Ter-Pogossian, 1992). In general, therefore, we can say that research in any field may have intended and unintended applications.

Research into information behaviour is not different in this respect from any other field: research may be directed at extending, verifying, improving the theoretical basis of the field, or at improving some aspect of information practices, such as information retrieval, information management, library services and digital library development, or at improving, correcting or understanding the role of information in other fields, such as health communication, agricultural practice, and information systems design. However, because information behaviour research is related to a field of practice, the applications are more likely to be intended, rather than unintended.

Discovering what effect any information behaviour research has on actual practice in the field is extremely difficult, if not impossible. This also applies to information science research in general. If research is used to inform and change practice it is not generally reported, except perhaps in the annual reports of libraries and information services. There is no 'practical use' index analogous to the citation index to tell us that research has been used to change practice. We only discover this, if at all, by accident, meeting up with practitioners at conferences, for example, and being told that such and such a paper has been used in guiding policy on some aspect of practice. Occasionally, one may receive an e-mail message reporting that a paper had been useful, or asking for further advice on some aspect of the research.

In this respect, determining the impact of research has changed little, if at all, since Craghill and Wilson (1987) noted that,

> *"research makes its impact through many channels, that the nature of the impact is as varied as the channels, and... in many cases, neither the diffusion of the research not its impact leave any observable trace in the literature of the subject."* (p. 71)

There are areas where information behaviour research is carried with some intention of influencing practice: agriculture is one such, with research being carried out by information science academics and PhD students, academics working in agriculture and agricultural extension departments, and by researchers in non-governmental organizations and international aid agencies. How effective the research is in actually changing practice probably depends upon the nature of the organization in which the researcher is working and, crucially, upon whether or not the work is commissioned and supported by the relevant government agencies.

For example, a study by Kabir et al. (2014) of the information needs of farmers in Bangladesh was carried out by staff of an agricultural extension department in a university and one might expect that the work would have some influence on the teaching of extension workers in that university. The authors conclude that 'it is necessary to ensure adequate information supply' to the farmer, but give no information on how this might be done. Nor does the report indicate any support from any government agency to carry out the work, or any indication that recommendations had been made to government on the matter. One would question, therefore, how likely it was that the work would have some influence outside of the department in which it was carried out.

Similar research was carried out in Tanzania by Lwoga et al. (2010): the authors were academic staff of information science departments. Again, recommendations were made on how to improve information services to farmers. But there is no indication of those recommendations being put to any government agency, nor any statement of support for the research from government. Without support and follow-up of this kind, it is highly unlikely that anything would change as a result of the research.

Another area that appears to be seeking guidance from information behaviour research is the travel and tourism industry. From a search of Web of Science it seems that interest began to grow from about the year 2000, when 21 papers were indexed, reaching a peak of 612 papers in 2015. One can understand why this might be the case: a good deal of the travel business has moved on to the Web,

with travel agencies less significant than they used to be, and this, together with the rise of services such as Airbnb, means that people are arranging their travel personally, online.

One example of the kind of research prompted by technological developments is that by Mistilis and D'ambra (2008), which studied '*The visitor experience and perception of information quality at the Sydney Visitor Information Centre*'. The research was carried out with the full collaboration of the Centre, so one may assume that the results and recommendations were at least received by the Centre's management: it is not recorded, however, whether any action was taken on the recommendations.

Murdy et al. (2018) carried out another study in collaboration with the staff of organizations (including museums and archives) providing services to ancestral tourists (that is, people pursuing their family history). They note that the findings will be of use to these organizations in developing appropriate services, and, as the organizations were involved in the data collection process there is, presumably, some probability that their strategic planning will be influenced. However, the paper does not provide any information on how the results were received by these organizations.

The problem faced by information researchers seeking to influence a particular field of practice is that the outputs that would reach the practitioners, such as presentations at practitioner conferences and publications in 'trade' journals, do not appear to count as 'research' outputs for evaluation purposes. That could change, of course, if more attention is given in research evaluation exercises to the impact of the research in the wider world, as is now the case with the UK's Research Excellence Framework (see Stern and Sweeney, 2020).

If the impact of research on fields of practice is difficult to determine, it is easier to assess the influence of information behaviour research on fields other than information science, through the usual channel of citation analysis.

Fields influenced

Some thirty years ago, Cronin and Pearson (1990) studied '*The export of ideas from information science*' through citations in non-information science sources to the work of six 'grandees'. These were all British researchers, namely, Bertram Brookes, Cyril Cleverdon, Robert Fairthorne, Jason Farradane, Maurice Line and Brian Vickery. Most of these researchers were active in the area of information retrieval, only Line had a more diverse research profile, which included information behaviour. Line was also the most highly cited of the authors, with 739 cites in the period 1980 to 1989, of which 70 were in non-information science journals. Cronin and Pearson did not provide an analysis by the importing subject field, but it is evident from the list of journals that Line's work was cited in health sciences, psychology, education, sociology and computer science.

In a paper for the 2018 ISIC conference (Wilson, 2018) I reported on the distribution outside the field of information science of citations to key papers by Dervin, Kuhlthau, Savolainen and Wilson. The extent to which these papers were cited in fields other than information science is shown in Table 7.1.

To gain some idea of how the ideas from information behaviour are used in other disciplines, we shall look a little closer at the

principal fields in which these authors were cited, that is, computing and information systems, health-related, business and management, and education. Citations also appeared in a number of social science journals but without sufficient concentration in any one field, such as sociology, for example, to warrant further examination.

Author	Total journal & review citations	Total citations outside information science	Percentage
Dervin	479	35	7.3
Kuhlthau	739	92	12.8
Savolainen	337	33	9.8
Wilson	809	150	18.5
Totals	2,364	310	13.1

Table 7.1 Citations in fields outside information science

Determining exactly *how* information behaviour research is used even within the disciplines to which it contributes is not easy. The only guide we have is how the information is cited and a number of attempts have been made to categorise citations. For example, Lipetz (1965) produced a scheme with four major categories and a total of twenty-nine sub-categories. This would be rather time-consuming to implement and the most useful classification is that developed by Small (1982) who used the terms, *perfunctory*, *reviewed*, *negative*, *supported* or *affirmed*, and *applied*. A *perfunctory* citation is one that simply identifies a work as connected to the research reported, but without further elaboration. For example, '*Kuhlthau suggests an information search process (ISP) model with six stages to describe the behaviour of seekers*', with no further reference to use of the model (Pang et al., 2015, p. 47). Typically, an author cited in this way will only be cited once or twice in the citing paper.

Reviewed means simply that the cited research is included in the citing paper's review of the relevant literature. The implication here is that the cited research has some close relationship to the citing research. *Negative*, rather obviously means that the citing research contradicts the cited research, while *supported* or *affirmed* means that agreement with the cited research has been found. For example, Savolainen's everyday life theory is *affirmed* by Branch (2003): *'The findings of the study are consistent with Savolainen's... assertion that "everyday life information needs proved to be quite heterogeneous"...'* (p. 12).

Applied is clearly the most significant type of citation, as it means that the cited research has been used in some way by the citing author: for example, as a theoretical framework for their own research, to guide the design of a data collection instrument, or to formulate hypotheses for testing.

In a follow-up paper to the 2018 ISIC paper I used this categorisation in investigating the citations received by papers by Kuhlthau, Savolainen and Wilson and found the following distribution: perfunctory - 36%; reviewed - 44%; negative - 0%; affirmed - 5%; and applied - 15% (Wilson, 2020). In what follows we shall concentrate on citations that imply the *application* of the cited research.

Computer science and information systems

Computer science and information systems research shares a common research *object* with information behaviour research; that is, the information user. From being machines that required specialised staff to program and use, computers have become a retail commodity, embodied most obviously in the mobile phone, which is, in fact, a multi-purpose, pocket computer. In moving from the room-filling device that was programmed with input from plugged wires, paper tape, punched cards and, ultimately, networked screen input, to the shirt-pocket device that is almost universal, computer scientists have had to consider the needs of users and how they behave in finding the information they need to satisfy those needs.

Information systems developers, too, have moved from data processing, which produced reams of printed data output, which had to be scanned by the human eye and interpreted to make sense in context, to modern information systems that generate a wide variety of outputs, mainly for on-screen viewing. In doing so, they too, have had to have concern for the information user. The term 'information requirements' originally meant, 'What the user needs to know in order to use our systems', and only lately has a genuine concern for user behaviour as an aid to system design emerged.

The *application* of information behaviour research takes a number of forms. The most extensive form of application is where the research is used as the basis for further research by the citing author. For example, in a doctoral dissertation on interactive information retrieval, White (2004) cites Kuhlthau's model of the information search process twenty-eight times in the dissertation, and notes that the model formed the basis for task selection in his own research. He goes on to say: '*I do not choose six task categories that correspond with the six stages in the ISP, but instead to the three types of searcher interaction that the model predicts;* **background seeking**, **relevant seeking** *and* **relevant and focused seeking**' [the author's emphasis] (p. 151).

Bozzon et al. (2013) used Kuhlthau's model as the basis for designing a prototype exploratory search system for Web data. This involved '*a mapping of concrete exploration actions to the cognitive model for online search proposed by Kuhlthau*' (p. 643). Evaluating the relevance Kuhlthau's model enabled the researchers '*to evaluate the relative importance of the various search phases, in terms of number of clicks and time spent*' (p. 656) in each phase. Not surprisingly, in an exploratory search system, most time and most clicks were used in Kuhlthau's *exploration* phase.

D'Ambra and Wilson (2004), note that, '*This model by Wilson (1999)… supports one of the fundamental propositions of this paper: that the goal of uncertainty reduction is fundamental to the use of any information resource within a problem resolution context'* (p. 295), which suggests that the model as a whole has been influential. They also go on to refer to another kind of application, pointing out that the uncertainty measurement scale was also derived from Wilson's work (p. 300).

Savolainen's (1995) model of everyday life information seeking was used by Hsu and Walter (2015), who combined that model with the technology acceptance model and Johnson and Meischke's (1993) comprehensive model of information seeking. Savolainen's model

was used specifically to develop hypotheses, for example, Savolainen's use of self-efficacy in the model is used to develop hypothesis H2:

> *H2: A consumer's perceived level of search skills when seeking information indicates whether his "go-to" website is a search engine, a centralized website, or a specialized website* (p. 265).

Health-related disciplines

The various health-related disciplines, which include medicine, public health care, nursing and related disciplines all have a concern for various aspects of communication. On one hand is the need to communicate effectively with patients and the general public on specific diseases and on general disease prevention. On the other hand is the need to ensure the effective communication of medical research and good practice within the health professions.

These concerns have a direct relationship with information behaviour, since the identification of information needs in the different communities, and the evaluation of systems designed to meet these needs are issues of central concern. It is not surprising then, to find information behaviour research applied in these fields.

Wilson had distinguished between active and passive searching (which have been re-named in Chapter 4), and this distinction was used as a dichotomised variable by Stonbraker et al. (2017), who state:

> *The first dependent variable was information seeking which, guided by Wilson's model, was dichotomized as active or passive, where active seekers are more engaged in the pursuit of health information and passive seekers may obtain information that is relevant to them while engaging in another behavior or without looking for it (p. 1592).*

Another example of the choice of a particular element of Wilson's theory is that by Zhang and Zhou (2019) who represent the affective dimension of the model by the concept of *fear* in their study of health-risk messages on social media. They represent this affective variable by the hypothesis:

> *H3: Fear aroused by risk messages is positively related to ITC [intention to click] the messages* (p. 1361).

Examples of the use of a model in its entirety include Rhebergen's (2012) application of Wilson's theory in his PhD thesis, where he notes:

> *In total, 14 questions [were] asked about factors that may motivate information seeking. These factors were based on Wilson's general theory of information-seeking behaviour* (p. 27).

In a study of online, health information-seeking in China, Cao et al. (2016) state that,

> *Guided by Wilson's… second model of information behavior... [this research] intends to identify the relationships among source characteristics, activating mechanisms, and OHISB [online health information-seeking behavior]* (p. 1106).

The research hypotheses are based, to a significant extent, on this model. All of the hypotheses were supported by the research; for example, '*hypothesis 3b posited that higher levels of Internet self-efficacy predict higher levels of OHISB*' and the research found a direct relationship between self-efficacy and the level of online information seeking. By testing hypotheses derived from the model, this kind of research affirms the theoretical propositions underlying the model.

Finally, in this brief review, Shieh, et al. (2009), in a study of information-seeking by pregnant women on low incomes, note '*This study adopted Wilson's model of information behaviour'* (p. 365), and go on to develop a 15-item scale,

> *to measure the five dimensions of barriers to information-seeking as suggested in Wilson's model, including psychological, demographic, interpersonal, environmental, and information source barriers.* (p. 366)

The authors conclude that their findings, *'support the proposition in Wilson's model of information behavior that information needs and information barriers predict the degree of information-seekin*g' (p. 369).

Education

It is a little surprising that relatively few examples of the application of ideas from the three chosen researchers was found in the education sector. It is not that education-related research does not exist: rather, such research tends to be reported in information science journals rather than in education journals.

Given the origins of Kuhlthau's work, it is not surprising to find applications in the field of education. For example, in a paper on the design of digital libraries for learning Marshall et al. (2006), make extensive use of the six steps of Kuhlthau's model in evaluating digital learning systems. They conclude that the systems lack support for all six stages and, in particular, lack support for the topic formulation and information collection stages.

In another study Lantz and Braga (2006), describe an extension of Kuhlthau's information search process model through the addition of further dimensions, such as the writing process and Ellis's (1997) information seeking characteristics.

Savolainen's everyday-life information-seeking model is employed in a doctoral study by Rolf (2016) on the use of mobile phones by international students. Rolf also employs the *information source horizon* method for data collection (Savolainen and Kari, 2004).

Wilson's model was used by Eneya and Mostert (2019) in a study of academic library service delivery to students with disabilities. The authors note that,

> *We chose Wilson's model of 1981 for this study because its focus on information need, the person seeking information and the context in which information is sought complement the social model of disability, whose main focus is barrier identification and removal.* (p. 74)

Management and business

On the basis of the research carried out for this chapter, the impact of information behaviour research in these fields is less than in computer science and health-related disciplines. The situation is complicated by the fact that management-related research can appear in the publications and conferences of other disciplines, much as information research can be disseminated. There are, nevertheless, some interesting examples.

For example, Kuhlthau's information search process model is used extensively by Görtz (2011) in a doctoral study of the information behaviour of young management consultancy professionals. Görtz reviewed a number of models relevant to his research and concluded,

> *it was assessed that Kuhlthau's information seeking process revealed the best fit compared to the qualitative observations gathered in the course of this study. It showed the least amount of process phase overlaps, process violations and out of scope phenomena. The common point of departure for model and observation is a task or problem, which – in the following – needs to be solved by the individual* (p. 189).

Venkatsubramanyan and Kwan (2008), in a paper on developing a Web search model for decision-making needs, also use Kuhlthau's search process model. They developed an experimental system based on the model which resulted in 480 observations of participants searching. On the basis of the data, the authors concluded, among other things, that, in conformity with Kuhlthau's model, '*A key aspect of decision making requires the satisfaction of information needs so as to provide a firm basis for the validity of a decision.*' (p. 212).

In a study on decision making in emergencies, Eisman et al. (2018) use Wilson's problem-solving model of the information seeking process as a central plank in their research framework. The model is used to define the decision-making process, and the results of the research demonstrate the value of social media sources at each stage of the process. For example:

> *'problem identification is said to benefit primarily from increased situational awareness... Harnessing situational information available from social media, decision makers can learn about crisis events, impacts, and consequences... Thus, social media can serve as social sensors or incident notification systems for emerging crises, security threats, or rumours circulating among a population...' (p. 9)*

Lösch and Lambert (2007), in a study of the information behaviour of participants in e-reverse auctions (i.e., where there is one buyer and many sellers), use Wilson's model. They note:

> *Owing to its comprehensive nature, Wilson's (1981; 1999) model provides a suitable conceptual map for investigating human information behavior in this research. Applying his model to the purchasing context, a supply/sales manager requires information to make the purchase/sales decision, which is why he seeks and exchanges information. (p. 49)*

It is not surprising that no applications of Savolainen's everyday life information-seeking model, were found in the business management

sector, given its intention. There were occasional references and in one case (Noh, 2016) variables relating to the use of social networks were derived from the model.

Conclusion

From the examples discussed in this chapter, as well as from Wilson (2020), we can see that the application of ideas from information behaviour research takes a variety of forms. In some cases a model is used in its entirety to underpin the importing research. This, of course, is the most beneficial mode of application from the point of view of the cited author as the research, if followed up, can be used to enhance the underlying theory of the model. Shortcomings of the models can be identified and elaborated.

Discipline	Importers	Exporters	Total
Computer science	67 (83%)	14 (17%)	81 (100%)
Education	27 (87%)	4 (13%)	31 (100%)
Health related	43 (91%)	4 (9%)	47 (100%)
Information systems	39 (76%)	12 (24%)	51 (100%)
Totals	176 (84%)	34 (16%)	210 (100%)

Table 7.2: Distribution of importers and exporters by discipline

The extent to which we can say that the ideas are being applied within the receiving discipline depends upon the authorship of the papers. We can divide these into *exporters*, that is, researchers in the field of information science who are publishing in the other discipline's journals and conferences; and *importers*, that is, researchers in the receiving discipline, bringing in ideas from information science (Cronin and Davenport, 1989; Cronin and Pearson (1990).

Table 7.2 shows the distribution of importers and exporters by discipline for the subjects considered in Wilson (2020):
The table shows that, in all four fields, the majority of authors were *importers* of ideas *from* information behaviour research, and, in the case of the health sciences, the vast majority were importers. In this area it seems that information behaviour research is already a kind of sub-discipline within health communication studies.

Overall, one has the impression that the importers are researching topics that could also be undertaken by information behaviour researchers. The exporters, on the other hand, are engaged in research where the receiving discipline is a source of similar research. For example, the exporters into information systems are often dealing with information users in interaction with information systems, while those exporting into education are carrying out work on school and university students.

Thus, the use of information behaviour research within other disciplines is a rather complex issue, and, as the ubiquity of the World Wide Web and Web-based resources and services increases, we might expect information behaviour research to be of relevance to even more disciplines.

Think about it

1. Imagine that you are an information manager in a small, high-technology company, which develops novel micro-chips. Under what circumstances would you think of using information behaviour research or research methods in your work?

2. Locate any work that uses Kuhlthau's information search process model in a context other than education. How is this model used? Does it appear to be used successfully? Are any modifications suggested?
3. Information science also draws upon theories from other disciplines: activity theory is a case in point. Why would you use activity theory for a project rather than, say, Savolainen's everyday-life information-seeking model?

Conclusion

8

How necessary will information behaviour research be in the future?

Conclusion

Outline

Introduction

What we now call information behaviour research has developed over many years, from the studies of the distribution of users of public libraries over social classes in the 1930s, to the investigation of the use of scientific information in the late 1940s and 1950s, to the user-centred research of the present day. The INISS project referred to earlier was, perhaps, the first investigation to adopt a qualitative and user-centred approach to information behaviour. The earlier concerns with how many journals scientists subscribed to, or their use of abstracting services, have morphed into seeking to understand what motivates information seeking, how the search for information is carried out, and how the found information is used.

The invention of the Internet and the World Wide Web has also changed the nature of research almost completely. Before these developments information seeking related to printed information resources, and the use of commercial databases such as Dialog (now Proquest Dialog) to locate those resources. The explosion of electronic publishing, together with publicly available search-engines, now means that electronic tools are used to discover electronic resources.

The creation of social media sites such as Twitter, Facebook, WhatsApp, and Instagram, along with the miniaturisation of computers into the pocket computer known as the mobile phone, has also changed people's communication behaviour and the exchange of information. Much information behaviour research now deals with how people use these systems and resources.

Disciplinary diversification

The interaction of people with information has never been solely the concern of information science, indeed the term *information seeking* was used by researchers in psychology almost twenty years before Wilson (1981) first advocated its use in information science.

Largely as a result of the computerisation of information in organizations, together with the e-publishing developments, many areas of work now involve computerised interaction with information. As a result, disciplines related to those work areas are taking an increasing interest in how people manage those interactions. Wilson (2020) found citations to the three information behaviour researchers he studied in forty different disciplines. Thirty years earlier Cronin and Pearson (1990) found the work of six UK information scientists was cited in seventy-three journals in other disciplines. More recently, Cronin and Meho (2008) found that:

> *the number of non-IS papers citing the IS literature has risen from 3,982 for the period 1977–1986 to 18,079 for the period 1997–2006, an increase of 354%. By way of contrast, the level of intrafield citations (IS citing IS) increased by a mere 33% during the same time period.* (p. 560)

The 'leading' importing disciplines, in terms of those importing from among the three information behaviour researchers, are those considered in Chapter 7, that is, computer science, information systems, health sciences, and education. Extending these to the top ten importers leads to including management, tourism, nursing, psychology, health informatics, and communication studies. For information science generally, Cronin and Meho (2008) found that the top ten importers for the decade 1977-2007 were computer science, business and management, health and medical sciences, education, literature, engineering, history, psychology, and law.

For the reasons set out above, it seems likely that this disciplinary diversification will continue for the future.

Thinking about the future

"It is difficult to make predictions, especially about the future."

This rather silly statement has been attributed to a number of people from the physicist Nils Bohr to Yogi Berra (baseball player and manager), but it appears to originate in a statement (unattributed) made by a member of the Danish Parliament (Quote Investigator). All that is really needed is the first part of the statement–it is difficult to make predictions.

It is certainly difficult, at the present time (in the middle of the Covid-19 pandemic) to make any predictions at all about the future of information behaviour research. The global economic impact of the pandemic is going to be considerable, and money which governments might otherwise have directed to education and research, may have to subsidise key businesses and industries to get the economy going again. There may also be some behavioural changes: for example, companies have been employing working from home to a great extent and, if that is found to be just as effective as working in the company headquarters, there may be an incentive to continue the practice. That will inevitably lead to more use of home broadband for business purposes and more links to distributed internal information systems. Questions will then arise as to how people manage their access to

information in these circumstances and what support is needed to make the interactions more effective.

Quite apart from the impact of the pandemic, changes in information technologies are likely to continue. The power of computers is likely to increase, bringing more capabilities to mobile phones and tablet computers, and interaction by voice is likely to become commonplace for virtually all applications. Computers of different kinds are also under development and may bring significant changes for the future: for example, a paper in *Nature Communications* (Fu et al., 2020) describes the creation of 'memristors', using the protein nonowires from the bacterium Geobacter sulfurreducens, to mimic the neural processes of the human brain. This could lead biologically-based computers, rather than today's silicon-based.

If biologically-based computing is unlikely to appear soon, quantum computers may get out of the laboratory sooner. Indeed Google announced in October 2019 that, using its quantum computer, it had carried out calculations in 200 seconds that would have taken 10,000 years on a present-day supercomputer (Childers, 2019). Quantum computers are not general purpose computers, but are appropriate for tasks associated with cryptography, simulation of sub-atomic processes, and manipulation of very large data-sets. They are appropriate for solving problems that would take even supercomputers many years to solve and, as a result, may lead to developments in the underlying materials and processes of standard computers.

Machine learning, a branch of artificial intelligence, will also make an increasing impact on the analysis of big data and, in all probability, on search engine development. Google has already changed its translation programme, having discovered that machine learning was producing better results than their existing system (Le and Schuster, 2016). It is worth pointing out, however, that machine learning is not the equivalent of general artificial intelligence, which has not yet been achieved: no form of AI at present is capable of judgement, which remains a unique human capability (Smith, 2019).

Human behaviour will also change, since we function within an environment composed of many forces and when those forces change or evolve or mutate, we change our behaviour. Thirty years ago, or less, if you observed someone walking along the street talking to themselves you would have assumed that they suffered from some mental illness; today you know they are using their mobile phone. Social media have changed the way people interact with one another and developments in voice recognition may get them talking to such systems instead of texting. Social question and answer services may also be affected by developments in machine learning, leading to answers being provided by the system as well as by the participants.

In short, we cannot take the present as a guide to the future and people will have to respond to these possible changes and to more. The world of the information behaviour researcher will be very different, because the world of information interactions will be different.

It seems very likely, however, that information behaviour research will continue to be a challenging area of information science (as well as of those disciplines discussed earlier). Because of the disciplinary diversification there will be an increasing need for information scientists to collaborate with researchers in other

disciplines, which is likely to bring greater theoretical diversity to the field.

A final word

I have suggested that information behaviour research will continue to have relevance into the future: it is now too firmly embedded in a number of disciplines, which are all subject to change, to disappear from the research world.

I hope that this little book will give the beginning researcher some idea of the complexity of the issues that surround the behaviour of people in interaction with information and information sources. I hope, too, that the reader will have learnt something about the nature of information and the always changing character of information resources; about what we mean by *information behaviour*, and the modelling of that behaviour; about the relationship of models and theory, and on thinking about developing theory. I hope, too, that the reader will have the confidence to use what they have learnt, whether in carrying out a local study of users of a library or other information agency, or in further academic research.

The book cannot, however, be a perfect introduction to that complexity and I would be glad to hear from readers about what they consider to be flaws or lacunae in the book.

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