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The Information Seeking and Communication Model (ISCM): a study of its practical application in healthcare

Andrew Robson and Lyn Robinson
Centre for Information Science, City University London

Abstract

Purpose – The recently developed Information Seeking and Communication Model (ISCM) combines elements from models of information seeking and those of communication. This study investigated the ISCM's application in the field of healthcare to test its validity and to identify insights that it may provide.

Design/methodology/approach – To investigate the model's application to information users, the findings from published literature on physicians' information behaviour were studied. To investigate its application to information providers, interviews were carried out with staff working for the National Institute for Health and Care Excellence and with employees of pharmaceutical companies. The findings were examined using deductive content analysis.

Findings – The findings endorse the validity of the model, with minor modifications. The ISCM provides practical insights into the behaviour of both users and providers of information and the factors that influence them. It can be used to identify ways in which information behaviour may be positively modified in both finding and communicating healthcare information.

Originality/value – This research demonstrates the practical value of a new model of information behaviour which was developed using insights from earlier models. In doing so it answers criticisms that research in library and information science often fails to build on previous research and that it has little practical usefulness.

Keywords – Information behaviour, Information seeking, Communication, Models, Healthcare, Physicians, Pharmaceutical industry, Content analysis

Paper type – Research paper

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Introduction

The term "information behaviour" has been defined in different ways. One widely quoted definition is that of Wilson, who describes it as "the totality of human behaviour in relation to sources and channels of information, including both active and passive information use" (Wilson, 2000). Pettigrew et al. (2001) refer to information behaviour as "the study of how people need, seek, give, and use information in different contexts, including the workplace and everyday living." Ingwersen and Järvelin define it as the "generation, acquisition, management, use and communication of information, and information seeking" (Ingwersen and Järvelin, 2005, page 259). The term has thus been taken to encompass a number of different activities and, in particular, information seeking and acquisition, use of information, and communication.

Much research has been carried out into information behaviour over many years. Studies of information seeking and use date back at least as far as the Royal Society Scientific Information Conference of 1948, at which several papers on the information behaviour of scientists were presented (Wilson, 1999). Research into communication has an even longer history: Lasswell's studies of propaganda and mass communication, for example, date back to the 1920s (Laswell, 1927). As a result of this research a large number of theories and models of information behaviour have been formulated. Those developed in library and information science (LIS) are usually concerned with the information seeker and, in particular, with information seeking (Fisher *et al.*, 2005; Case, 2012). Mass communication models, on the other hand, typically describe the communication process, with the emphasis on the perspective of the communicator (McQuail and Windahl, 1993; Baran and Davis, 2003). In a previous paper (Robson and Robinson, 2013) we described a new Information Seeking and Communication Model (ISCM) that combines factors affecting information behaviour derived from a number of established models. Our aims were:
1. to build on prior research
2. to develop a model that is more comprehensive than previous models by encompassing information seeking, information use and communication
3. to produce a model that can be shown to be of practical value

One of the motives for developing the new model and for the research described below was to address criticisms that have been made about information behaviour research. A common theme raised by critics is that research in library and information science often fails to build on existing research and theory: "the one constant complaint of commentators has been that researchers have not built upon prior research in such a way as to cumulate a body of theory and empirical findings that may serve as a starting point for further research" (Wilson, 1999). The ISCM answers this criticism in that it was developed by building on and incorporating insights from previous models.

A second recurring theme concerns the practical relevance of LIS research. In 2002 Case (2002, pages 284-287) reviewed the criticisms of research into information behaviour and asked "what of the *utility* of information behavior studies?... to read some of today's

information seeking research it would seem that we have now reached the point where the scholarliness of the studies correlates with their degree of *uselessness* for institutional purposes." Case made exactly the same criticism in 2012, indicating that nothing had changed during the intervening ten years (Case, 2012, pages 370-371). The research described in this paper addresses this criticism by investigating the applicability and usefulness of the ISCM in the field of healthcare.

The Information Seeking and Communication Model

The Information Seeking and Communication Model was developed by examining a range of existing models from the fields of library and information science and communication studies (Dervin, 2005; Ellis, 1989; Gerbner, 1956; Gorman, 1999; Ingwersen and Järvelin, 2005; Johnson, 1997; Katz and Lazarsfeld, 1955; Kuhlthau, 1991; Leckie *et al.*, 1996; Maletzke, 1963; Rogers, 2003; Schramm, 1997; Shannon, 1948; Thackeray and Neiger, 2009; Wilson, 1999). The model is shown diagrammatically in Figure 1. A detailed description of it has been given previously (Robson and Robinson, 2013; Robson, 2013). In brief it shows an information user seeking and using information, and an information provider or providers communicating information. The continuous arrows show information seeking and related activities, and the dashed arrows show communication and related activities.
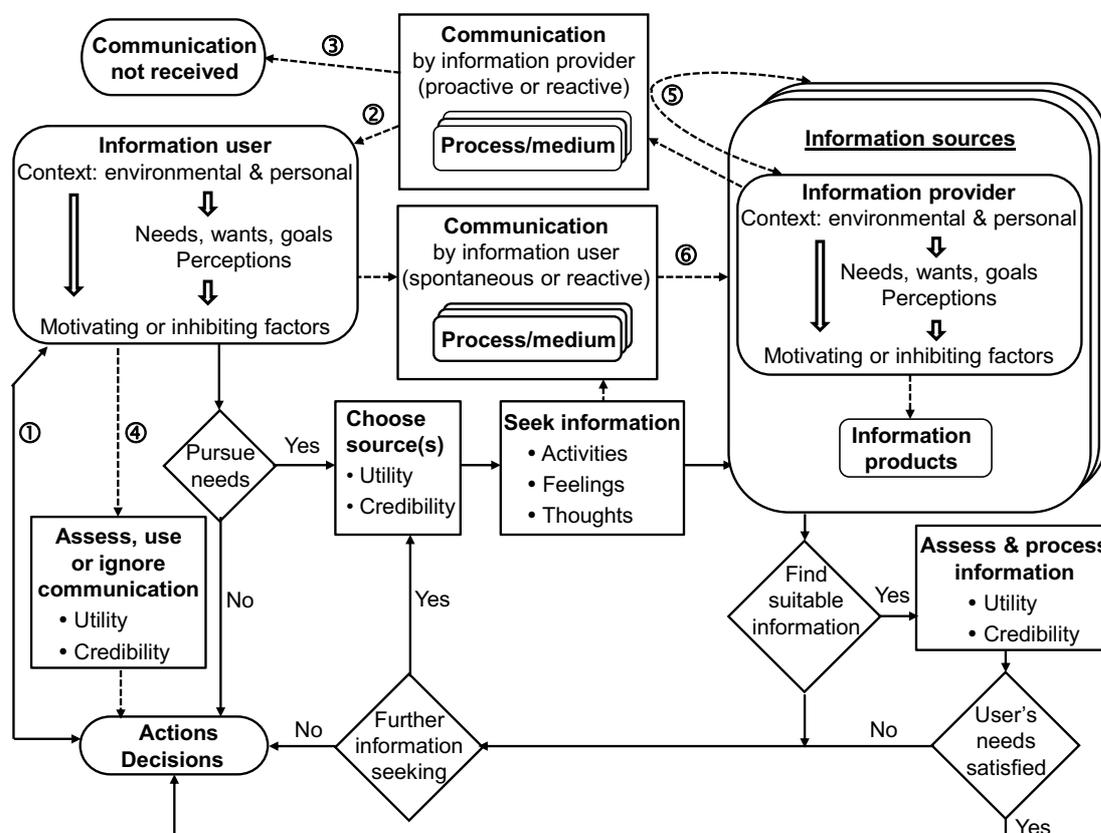
Figure 1. Information-seeking and communication model (ISCM)

Information users and providers are affected by their environmental contexts including their living, working and cultural environments. They are also affected by their personal contexts such as knowledge, experience and psychological factors. These contextual factors inform their needs, wants, goals and perceptions, which in turn may motivate them to seek or communicate information or inhibit them from doing so.

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The ISCM identifies two particularly important characteristics that influence a user's choice of sources and use of information: credibility and utility. Credibility refers to perceived trustworthiness, reliability, accuracy, objectivity, authority, completeness and lack of bias of information and its source. It also encompasses the concept of homophily (Rogers, 2003), that people are more likely to be influenced by those who are similar to them (homophilous) than by those who are different (heterophilous). Utility refers to the perceived usefulness, relevance, importance, timeliness, accessibility and ease of use of information or a source. The box headed "Seek information" in the model encompasses the activities involved in seeking information, such as using a search engine or communicating with an information provider. It also refers to feelings and thoughts that an information seeker has and which may affect information behaviour. These may include interest in a subject, uncertainty or confusion as the search for information starts, and perhaps clear thinking and confidence during the information search process, as described by Kuhlthau (1991).

The ISCM shows that communication can be a two-way process: an information user may communicate with a provider, shown by arrow ⑥. Information providers may also communicate with each other (arrow ⑤). A feature of the model is that it can be broken down into simpler component as in Figure 2, which shows this two-way flow of information between provider and user.
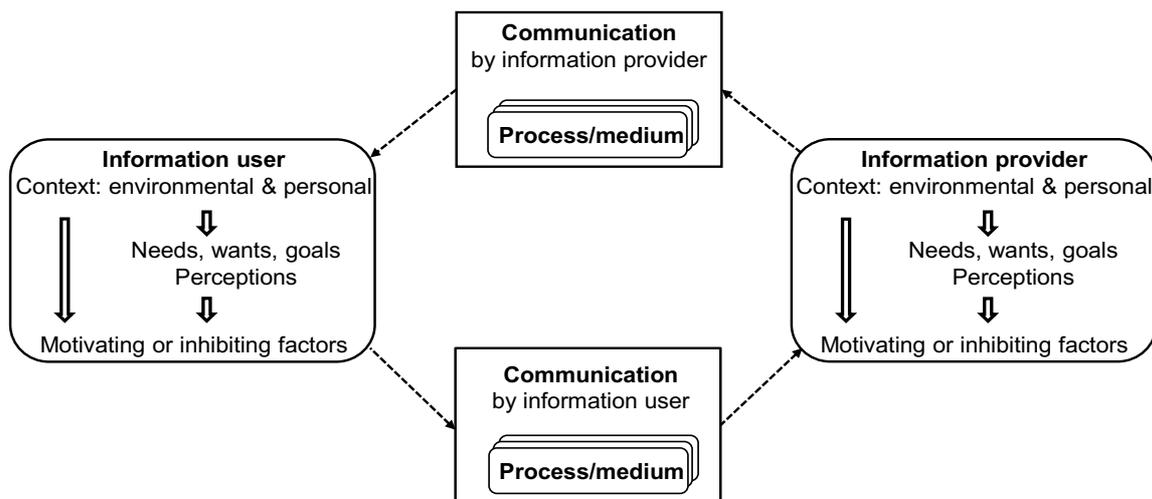
Figure 2. Two-way communication as represented in the ISCM

This representation emphasizes the fact that provider and user roles are interchangeable: a user can become a provider and vice versa. The two-way flow of information between providers shown by arrow ⑤ in the complete model (Figure 1) is another way of representing the same thing. The model thus emphasizes the fact that information behaviour can be highly interactive, with users communicating with other users (in their role as providers) and sharing information with each other. This is an important insight from the model: the "information user" depicted in so many LIS models does not play a fixed role but at one point may be a seeker of information and at another a provider. Thus in a two-way conversation one person

may ask a question (the "user" role) which another person answers (the "provider" role) whereupon the first person responds with his/her views or other information (the "provider" role). This alternation between user and provider roles is of course commonplace in information behaviour – people are both consumers and producers of information. However, this fact is not made clear in most LIS models because of their focus on the user role.

The healthcare information domain

The primary aim of the study described in this report was to investigate the validity of the ISCM. To do this it was necessary to examine the behaviour both of those who seek and use information and of those who communicate information. Healthcare was chosen as a suitable information domain in which to carry out this research because it involves experienced seekers and users of information (healthcare professionals) and different information providers.

The information behaviour of healthcare professionals, especially that of physicians, has been extensively studied since at least the 1940s (Sherrington, 1965) and there have been many reviews of the findings (e.g., Case, 2012, pages 301-308; Coumou and Meijman, 2006; Davies, 2007; Dawes and Sampson, 2003; Lacey Bryant, 2000). Physicians have to deal with a large volume of information every day: they need details of the patients they are treating, of the conditions being treated and appropriate medicines, and they may need a range of other information (Gorman, 1995; Smith, 1996). To meet these needs they may actively seek information from a number of sources, including colleagues, journals, books, websites and other computer-based and electronic sources (Bennett et al, 2005; Davies, 2007; Robinson, 2010; Smith, 1996). In the present research previous studies of physicians' information behaviour were examined to test the application of the ISCM to physicians as seekers and users of information.

A variety of individuals and organizations provide information to physicians, including colleagues, researchers, professional bodies, health services, government bodies and the healthcare industry. To test the applicability of the ISCM to information providers two were selected: the UK National Institute for Health and Care Excellence (NICE) and the pharmaceutical industry. In both cases the information that they provide has significant influence on healthcare professionals but their aims and objectives are different.

NICE was established by the UK government in 1999 as the National Institute for Clinical Excellence to provide guidance for the National Health Service (NHS) to "reduce variation in the availability and quality of NHS treatments and care" (http://www.nice.org.uk/aboutnice/whoweare/who_we_are.jsp). Its role has expanded over time and in 2013, under the Health and Social Care Act 2012 (http://www.legislation.gov.uk/ukpga/2012/7/contents/enacted), it was reconstituted as the National Institute for Health and Care Excellence. Under that Act it is now a Non Departmental Public Body sponsored by the Department of Health but operationally independent of government. NICE provides various types of guidance, recommendations

and information to healthcare professionals and others, including the following (http://www.nice.org.uk/):

- Clinical guidelines giving recommendations on the appropriate treatment and care of patients with specific diseases and conditions
- Technology appraisals providing guidance to healthcare professionals on the effectiveness of medical products, surgical procedures etc
- NICE quality standards designed to measure quality and promote improvements in health and social care
- NICE Evidence, a web-based search tool and portal that provides access to high-quality information and evidence about healthcare and social care

The research-based pharmaceutical industry is the single biggest sponsor of medicines research in the UK and the USA and is thereby the largest generator of information about new medicines (Collier and Iheanacho, 2002). Such information includes the findings from clinical trials, most of which are sponsored and designed by pharmaceutical companies (Goldacre, 2012, page 172). The industry spends heavily on information products and activities aimed at healthcare professionals, including advertisements, presentations by sales representatives, websites and responses to enquiries. It has been claimed that "Although the primary function of drug companies is to develop and market drugs, these companies spend more time and resources generating, gathering, and disseminating information" (Collier and Iheanacho, 2002).

Pharmaceutical companies are driven by commercial goals: they develop and market medical products in order to make profits. The information that they disseminate about those products is often promotional in nature, emphasizing the benefits that they can provide in the treatment of patients. The aim of pharmaceutical advertising and other marketing activities is to encourage physicians and other healthcare professionals to prescribe or use a particular company's product(s). Companies' activities in this regard have led to concerns about the influence of the industry and its motives. The Royal College of General Practitioners, for example, commented: "There is a perception amongst professionals and the public that the pharmaceutical industry's drive for profit has overridden considerations of honesty, openness, and cost-effectiveness" (Royal College of Physicians, 2009, page 9). However, pharmaceutical companies also provide factual, non-promotional information, for example at scientific meetings and through their medical information departments in response to requests for information (Robson and Riggins, 2001). Provision of information by the UK industry is governed by the Human Medicines Regulations 2012 (http://www.legislation.gov.uk/uksi/2012/1916/contents/made). Most companies also agree to comply with the ABPI Code of Practice for the Pharmaceutical Industry (2014). Among other requirements, the ABPI Code stipulates that "Information, claims and comparisons must be accurate, balanced, fair, objective and unambiguous and must be based on an up-to-date evaluation of all the evidence and must reflect that evidence clearly. They must not mislead either directly or by implication, by distortion, exaggeration or undue emphasis" (Clause 7.2).

Methods

To test the model's applicability to information users, the findings from published studies of physicians' information behaviour were examined. In this way the research built on previous work rather than repeating what had already been done. The technique known as deductive or directed content analysis (Hsieh and Shannon, 2005; Elo and Kyngäs, 2007) was employed, using coding terms derived from the model. To test its applicability to information providers, interviews were carried out with staff working for NICE and with employees of a selection of pharmaceutical companies in the UK. Investigating two types of information provider with differing goals provides a more robust test of the ISCM than could be achieved by using the model to study the information behaviour of just one of them. The interview transcripts were analysed, again using deductive content analysis.

Content analysis

Content analysis is a well-established technique for analysing texts and other communications for their content using quantitative or qualitative methods (Krippendorff, 2004). Quantitative content analysis has been defined as "the systematic assignment of communication content to categories according to rules, and the analysis of relationships involving those categories using statistical methods" (Riffe et al, 2005, page 3). It has been used for over a century to analyse the content of newspapers and, more recently, other media (Krippendorff, 2004). Quantitative analysis can be used to count words and their frequency of occurrence but it does not provide insights into the deeper meaning represented in the text. Qualitative content analysis has been increasingly used in the humanities and social sciences, using close reading of text for detailed analysis of its meaning: "Qualitative content analysis goes beyond merely counting words to examining language intensely for the purpose of classifying large amounts of text into an efficient number of categories that represent similar meanings" (Hsieh and Shannon, 2005). It has been defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh and Shannon, 2005). Coding may be applied to a word, a phrase, a sentence or sometimes a paragraph. Graneheim and Lundman (2004), in describing the techniques of qualitative content analysis, refer to such a portion of text as a meaning unit: "words, sentences or paragraphs containing aspects related to each other through their content and context."

Content analysis may be used inductively, categorizing elements of the text into categories generated from the text itself (Forman and Damschroder, 2007). Alternatively it may be used deductively (also known as directed content analysis), employing terms derived from a theory or model (Elo and Kyngäs, 2007; Hsieh and Shannon, 2005; Mayring, 2000). The latter technique was used in this research. First a code book was developed listing coding terms, with definitions, representing the features of and factors affecting information behaviour identified in the ISCM. Table 1 shows an extract from the code book.

Coding term	Used for
Information	Information; data; content of an information product; also used for information provided as guidance, advice or advocating a course of action.
User	May be an individual, group or organization that: − uses information e.g. to take a decision or action − seeks information − has information needs
User's context	The user's environmental and personal context: living or working environment, resources available, culture, job role, knowledge, expertise, psychological factors.
User's needs, wants, goals	Personal or job-related information needs, desires or aims that may lead to information seeking.
User's perceptions	Perceptions of self and self-efficacy; perception of a knowledge gap; perceptions of others including sources and information providers.
Provider	Individuals, groups and organizations that produce, supply or communicate information, or facilitate or control access to it.
Provider's context **Provider's needs, wants, goals** **Provider's perceptions**	The code book defines these concepts in similar ways to the equivalent concepts for users
Sources	General term covering information products, media or the providers of information. These more specific terms are preferred when coding text.
Information products	Literature, databases, websites, presentations, TV and radio programmes and other outputs from providers.
Utility	Perceived usefulness, relevance, importance, timeliness, accessibility or ease of use of information or a source.
Credibility	Perceived trustworthiness, reliability, accuracy, objectivity, authority, completeness and lack of bias of information or of a source; homophily of a source.

Communication	The process of communicating, disseminating or sharing information by an information provider or by a user.
Communication medium	The medium or channel through which information is communicated, e.g. the Internet, traditional publishing, mass media.
Seek/search for information	The activities involved in seeking information – e.g. using a search engine to search the Internet, using a database such as PubMed, or asking a question of a colleague or other source.
Act/decide	Take action or make a decision on the basis of the information.

Table 1. Extract from the code book used for content analysis

The coding terms were used to analyse reports from the literature on physicians' information behaviour and transcripts of interviews with members of staff from NICE and from pharmaceutical companies as described below.

Data collection and analysis

In the first part of the study the general features of physicians' information behaviour and the factors affecting it were identified from a review of the literature. An initial assessment of the validity of the ISCM was made by comparing these features with those described in the model.

Using deductive content analysis a more detailed study was then carried out on the findings from five representative reports of physicians' information behaviour (Green and Ruff, 2005; Hughes *et al*., 2010; Lacey Bryant, 2004; Prosser *et al*., 2003; Reddy and Jansen, 2008). These reports were selected because:
   a) all involved direct interviews with or observation of physicians
   b) each report is detailed and includes quotations from the physicians or vignettes describing activities observed during the study
   c) together they cover both primary and secondary care physicians (general practitioners and hospital doctors)
   d) together they cover a number of different aspects of information behaviour:
      − information needs
      − individual information seeking activities
      − collaborative information seeking activities
      − the use of different types of information sources, including printed sources, people, databases and websites
      − problems encountered in information seeking
      − factors affecting the evaluation and use of information

The sections of each report describing the findings were read in detail and each portion of text referring to features of information behaviour or factors affecting it was coded with

relevant terms from the code book wherever possible. If any text did not seem to be adequately represented by the existing codes a new term was added. At the end of the analysis of each report, any new terms and the concepts they represented were reviewed to determine how far the model covered them and whether it needed to be modified.

To test the model's applicability to information providers, semi-structured interviews were carried out with staff working for NICE and with employees of a selection of pharmaceutical companies in the UK. To provide structure to the interviews and to ensure that each participant was asked about the same topics interview guides were used. The questions sought to explore elements of information behaviour suggested by the ISCM. They covered the interviewee's context including role and background, the information provided by the organization (pharmaceutical company or NICE) for physicians, its aims or goals in doing this, and the perception in the organization of physicians' information needs and of appropriate information sources. Interviewees were also asked about perceptions of credibility and utility of information and sources, as the ISCM identifies them as important factors affecting information behaviour. Participants were encouraged to talk freely, to elaborate on any topic and to raise additional topics of relevance. The interview transcripts were examined by deductive content analysis.

This was a qualitative study and the number of interviewees was not specified in advance. "To the common question about interview inquiries, 'How many interview subjects do I need?', the answer is simply: 'Interview as many subjects as necessary to find out what you need to know.'" (Kvale, 2007, page 43). The interview transcripts were analysed on a continuing basis and new interviewees were included until:
   • enough information had been gathered to assess the model;
   • a clear picture had been obtained of the perspectives from NICE and from the pharmaceutical companies; and
   • no further insights were likely.

Seventeen pharmaceutical companies were selected, representing a mix of large, medium and small companies with headquarters in the UK, Europe, the USA or Japan. Details of the research project were sent by email to the UK offices of the companies inviting them to participate and to nominate an experienced member of staff from the medical department and another from the marketing department to be interviewed. The reason for inviting participation from the two departments was to obtain different perspectives. The medical department in a pharmaceutical company is normally responsible for providing factual medical information in response to enquiries from healthcare professionals (Robson and Riggins, 2001), while the marketing department is responsible for the company's advertising and promotional activities (Levy, 1994).

Thirteen members of staff from ten companies agreed to participate – one person from each of seven companies and two from each of the other three companies. Of the ten participating companies, two had headquarters in the UK, four in the USA, two in Germany, one in Switzerland and one in Japan. Nine of the interviewees were from medical or compliance

departments (the compliance function having responsibility for ensuring a company's compliance with legal requirements and regulations and with the pharmaceutical industry's codes of practice) and four were from marketing/sales departments. The final interviews revealed no further insights beyond those gained from the earlier interviews, suggesting that the sample size was adequate to provide a representative selection of companies' views.

For the interviews with NICE 18 members of staff in a variety of roles were contacted, of whom five agreed to participate, a response rate of 28 per cent. It had been anticipated that only a relatively small number of interviewees would be needed from NICE because it is a single organization with a consistent goal in its communication with physicians to provide guidance and advice that are "based on the best available evidence and set out the best ways to prevent, diagnose and treat disease and ill health" (NICE Charter, 2013). This supposition proved to be correct as the fourth and fifth interviews revealed no insights into information behaviour that had not already been identified in the first three interviews.

Findings

Information behaviour of physicians: literature review

A fundamental proposition of the ISCM is that an information user exists and acts within a context which affects the user's needs, wants, goals, perceptions and information behaviour. The findings from the literature demonstrate that this is the case for physicians.

Working in the healthcare environment, a physician's main role is to treat patients. To decide on a diagnosis and appropriate treatment for a particular patient, a physician needs information, and this need may lead to information seeking behaviour (Gorman, 1999). Specific needs depend on the particular environmental context in which the physician works including job role, location and health service environment. For example, because of the involvement of hospital-based physicians in clinical research and in teaching junior doctors, they are more likely to need information related to research and to teaching than is the case for general practitioners (Davies, 2011). General practitioners, on the other hand, more often than hospital doctors, seek information that they can give to patients about their illnesses and treatments (Bennett et al., 2005; Davies, 2011). Specialists need more in-depth information about their specialty areas and so are more likely to research the literature than are generalists (Bennett et al., 2005; Masters, 2008). A physician's personal context also influences information behaviour, notably his or her experience and expertise. Thus junior doctors tend to need more guidance and background information about diseases and their management, whereas their more senior colleagues tend to ask more specific questions relating to diagnosis, prognosis and treatment (Davies, 2007). These examples, taken from a more detailed literature review (Robson, 2013), endorse the relevance of the ISCM to physicians and the model's focus on context as a key factor influencing their differing needs and behaviour as information users.

Related to a user's context in the ISCM are motivating and inhibiting factors that affect his or her decision to seek information and the choice of information sources. The literature shows that this is true of physicians, who may pursue only about a third to a half of the questions that arise when caring for patients (Covell *et al.*, 1985; Ely *et al.*, 2005; Gorman and Helfand, 1995). Various inhibiting factors that discourage physicians from seeking information have been identified, such as workload and lack of time, doubt about the existence of relevant information, lack of urgency, uncertainty about where to look for information and lack of search skills (Davies, 2007; Ely *et al.,* 2005). Motivating factors that encourage physicians to seek information include the urgency of the patient's problem and a belief that an answer to a question exists (Gorman and Helfand, 1995).

The literature also confirms the ISCM in showing the importance of perceptions in information behaviour. Information seeking and use by physicians is influenced by self-perception, such as perception of their own knowledge and knowledge gaps and of their skills or lack thereof in using information resources (Fourie, 2009). The perception of credibility is shown in the ISCM as a factor affecting a user's choice of an information source and the assessment, use or non-use of information. The literature confirms the influence of this factor on physicians' information behaviour, including their perceptions of the quality, authority, trustworthiness and reliability of information and sources (Revere *et al.*, 2007; Tracy *et al.*, 2003). But as the model also indicates, the utility of the information or source is important too – notably its accessibility, ease of use and relevance. For example, in a study of physicians' information seeking using the Internet, Bennett *et al.* (2004) commented: "Critical to seeking clinical information is the credibility of the source, followed by relevance, unlimited access, speed, and ease of use." Utility is of great practical relevance and the literature shows that physicians may use information because it is easy to access rather than having a perceived high level of credibility (Curley *et al.* 1990).

The ISCM depicts information seeking as involving activities by the information user and feelings and thoughts that he or she may experience. Physicians' activities in seeking information include asking colleagues, checking printed sources such as textbooks, reference books and journals, and using electronic sources including websites and social media (Bennett *et al.*, 2004; Berben *et al.*, 2011; Davies, 2007; Ely *et al.*, 2005; Mansfield *et al.*, 2011). Some physicians experience stress when uncertain and spend more of their search efforts on analysing results, while others are less stressed by uncertainty and rely more on heuristics than detailed analysis (McKibbon *et al.*, 2007). They may have feelings of confidence in their searching abilities and may not question what they find or whether they have found everything that is relevant. (Bennett *et al.*, 2004; Cullen *et al.*, 2011).

Information found by a user or communicated by a provider can influence the user's decisions and actions. The ISCM also shows that a user may take decisions or actions without seeking additional information or after dismissing or ignoring information from external sources. In these respects the model again reflects physicians' information behaviour: they may decide or act on the basis of information that they have sought (Gorman

and Helfand, 1995) or received (McGettigan *et al*., 2001), or simply on the basis of their existing knowledge and experience (Gorman, 1999).

Thus the literature on physicians' information behaviour provides evidence of the validity and applicability of much of the Information Seeking and Communication Model as it relates to those who seek and use information, and specifically:

- The user in context
- The user's needs, wants and goals
- The user's perceptions
- Motivating and inhibiting factors
- Information sources, information providers and information products
- Choosing information sources: credibility, utility and other factors
- Seeking information
- Communication, process and medium
- Assessing and processing information
- Actions and decisions

However, in this review of the literature the findings were analysed in relation to the concepts in the ISCM. What is needed in addition is an analysis that attempts to identify any features of information behaviour that are not adequately represented in the model. For this reason a more detailed analysis of the findings from individual studies of physicians' information behaviour was carried out, the results of which are presented below.

Information behaviour of physicians: deductive content analysis of five studies

The following five studies of physicians' information behaviour were selected for the reasons listed earlier:

- Green and Ruff (2005) used focus group discussions to investigate the problems encountered by junior hospital doctors in the USA when seeking to answer their clinical questions.
- Hughes *et al*. (2010) studied the online searching activities of hospital- and clinic-based physicians in the UK and their judgements of information quality from diaries recording their clinical information searches and by interviewing them.
- Lacey Bryant (2004), using a case-study approach, interviewed general practitioners in the UK to investigate their individual information needs and information seeking behaviour.
- Prosser *et al*. (2003) interviewed general practitioners in the UK in order to explore the influences and information sources affecting their prescribing decisions.
- Reddy and Jansen (2008) studied collaborative information behaviour in hospital healthcare teams in the USA using observation and questioning. Many studies and models of information behaviour focus on an individual information user's perspective. It was therefore of interest to discover what additional insights could be obtained from this

study of collaboration in information behaviour and how well the ISCM represents such behaviour.

The content analyses of these studies indicate that the ISCM adequately represents key features of information users' behaviour and factors affecting it. To illustrate this, the analysis of the study by Reddy and Jansen (2008) is discussed here in some detail.

Reddy and Jansen (2008) studied collaborative information behaviour among healthcare professionals in two hospitals in the USA: the surgical intensive care unit (SICU) in a large urban teaching hospital and the emergency department (ED) in a small rural non-teaching hospital. Their findings were obtained using an ethnographic approach, with observation and questioning of staff about how they obtained information. Content analysis of the report showed that many of the coding terms derived from the ISCM applied to the information behaviour observed in this study, as may be seen from the following extracts.

– **Extract 1**
   "Because the work was often rapid-paced in the SICU and ED, communication was essential to finding needed information. In both units, team members were physically co-located and, therefore, much of the interaction was face-to-face." (Page 263)

Here the authors set the scene, describing the environmental context of the information users, noting that they have information needs and observing that communication with colleagues was an important way for users to find information. The extract includes several concepts from the ISCM:

* Information
* Information users ("team members")
* Information users' environmental context (a "rapid-paced" working environment where "team members were physically co-located")
* Motivating factor for particular information behaviour (the rapid pace, which made communication with colleagues "essential to finding needed information")
* Communication (two-way)
* Finding information
* Users' needs ("needed information")
* Communication medium ("much of the interaction was face-to-face")

– **Extract 2**
   "John, a resident, is checking on some medication that the patient is receiving. He asks the nurse if she knows why the patient is receiving a medication that John is not familiar with. The nurse shrugs her shoulder and tells John to talk to Susan, the pharmacist. Susan who standing close by walks over and says, 'I know what that medication does but I am not sure why this patient is getting it'." (Page 263)

This vignette illustrates the sort of interactive communication between healthcare professionals that the authors observed. A number of concepts from the ISCM are relevant here, including:

- Information seeking through communication ("He asks the nurse ...")
- Information user's personal context – knowledge or lack of knowledge ("a medication that John is not familiar with", "I know what that medication does")
- Communication ("The nurse ... tells John to talk to Susan", "Susan ... says...")

- **Extract 3**
  "Both John and Susan then start looking for more information about why the patient is getting this medication. Susan is providing John information about the medication and the possible side-effects. During this process, they are continuously exchanging information until they piece together the story. They realize that the patient is getting the medication by mistake. They then stop the medication." (Page 263)

Key aspects of information behaviour in this extract are:

- Information seeking – collaboratively ("John and Susan then start looking for more information")
- Information provider ("Susan is providing John information")
- Communication – two-way ("they are continuously exchanging information")
- Processing information – collaboratively ("they piece together the story")
- Action – collaborative ("They then stop the medication")

The particular focus of Reddy and Jansen in this study was on collaborative information behaviour and this extract provides examples of such behaviour. When analysing the text a new coding term, "collaborative information behaviour", was initially used. Once coding was complete the sections of text coded with this term were reviewed to determine if they represented concepts that were not included in the ISCM. The specific collaborative information behaviours observed in the study were collaborative information seeking, collaborative information processing, and collaboration in decision making and taking action, all of which are illustrated in this extract. A related activity was information sharing, which other authors have also described (Bao and Bouthillier, 2007; Pilerot, 2012; Talja, 2002); the two-way communication in this extract is an example and it shows that a user of information (Susan) can become a provider of information to another user (John). To show this interaction between information users minor modifications to the model were made as described below (see Figure 3).

These extracts and other parts of the text demonstrate the applicability of the following concepts from the ISCM:

- Information
- Information user
- User's context
- User's needs, wants, goals
- User's motivating factors

- Choose information source
- Information seeking
- Information sources
- Information providers
- Information products
- Find information
- Assess/process information
- Actions/decisions
- Communication
- Communication medium

The analysis of the findings from this study provides support for many aspects of the ISCM's representation of information behaviour. Information users have information needs that derive from their working context. In this report John, the physician, is responsible for the care of a patient and needs to find out about the medication the patient is receiving and also to find a cause of the patient's spike in temperature. As suggested by the ISCM, information needs may derive not only from the environmental context but also from the user's personal context. In this case John's need for further information about the patient's medication is driven by his personal lack of knowledge about the particular medicine concerned. The ISCM also refers to the role of motivating factors in encouraging particular information behaviour. In the report the rapid-paced environment in the hospital, with a need to take actions and decisions quickly, encourages communication between colleagues in order to find and share information. Such sharing of information is shown as two-way communication in the ISCM (Figure 2), with information users acting as information providers. Once information has been obtained, the ISCM shows that the user may assess and process it before acting on it. In extract 3 the healthcare professionals process information, using it to "piece together the story" and then act on it – "They then stop the medication". The important influence of credibility and utility on information behaviour, as depicted in the ISCM, is implicit in the findings. If healthcare professionals rely on each other as information sources they must perceive each other to be credible. They also have high utility in that they work together and it is easy to ask each other questions.

Content analysis of the four other reports of physicians' information behaviour (Green and Ruff, 2005; Hughes *et al.*, 2010; Lacey Bryant, 2004; Prosser *et al.*, 2003) endorsed the validity of the ISCM. Many of the coding terms derived from the model were found to be applicable to these other reports, including terms not used in the analysis of the report by Reddy and Jansen, such as utility, credibility, user's perceptions, user's inhibiting factors, and feelings and thoughts during information seeking.

The following extract from the report by Prosser *et al.* (2003, page 64) illustrates the relevance of the concepts of utility and credibility:

> "Ninety-two of the GPs saw representatives, and most (70%) regarded
> representatives as an expedient means of acquiring and processing drug information
> and keeping up to date with new products. Although GPs questioned the objectivity of

the industry, they generally considered its information to be factually accurate, if selective.... Despite GPs' concern regarding commercial information, a long-standing and trusted relationship with a company or representative led to accepting drug information, and reduced the perceived risk."

The utility of company representatives as "expedient" sources of information influences general practitioners to use the information that they provide, which in turn influences the GPs' prescribing decisions. Although the GPs believe that such information may be selective, they perceive it to be sufficiently credible – "factually accurate" – to use it, apparently without further assessment.

The utility of an information source is also clear from this extract from the report by Lacey Bryant (2004, page 90):

"... having to go away and visit a library remotely makes it less likely to happen, and it's very valuable to be able to pop upstairs to look at it and get back to the patient ... Using this one here [the library in the GP's practice] is fine. It's convenient, it's small. That's half the problem with the one at Stoke [Mandeville]. It's feeling a little bit lost there … I think 'Oh God, everyone's wondering who I am' … but having said that I mean it's a very user-friendly place."

In this case the utility of the library in the GP's own practice – its convenient location and small size – is a motivating factor for its use. The lower utility of the library in the postgraduate centre at Stoke Mandeville Hospital, partly because of its more distant location, is an inhibiting factor. This extract also gives an example of feelings and thoughts that may occur during information seeking: because of the library's large size, the GP feels "lost" when using it and thinks that other people there wonder who (s)he is.

An example of the role of a user's perceptions – of information sources and of their credibility – appears in this extract from the report by Prosser *et al*. (2003, page 66):

"If the consultants who I perceive to be the better consultants are actively prescribing something then that would influence me. Occasionally, there may be a negative influence—someone who you don't feel is that on the ball or someone who you know is maybe influenced by pharmaceutical companies."

Here the GP is influenced by "consultants who I perceive to be the better consultants". However, the GP perceives that some other consultants have less credibility – perhaps if their knowledge or expertise is inadequate (not "on the ball") or if pharmaceutical companies have influenced them.

The importance of credibility as a factor in the use of information is also a prominent finding in the study by Hughes *et al*. (2010). The following extract for example illustrates the trust with which one of the physicians interviewed regards guidelines issued by NICE (Hughes *et al*., 2010, appendix):

> *"Like NICE guidelines is something that has been rigorously worked out. You wouldn't check it is something that you would trust."*

The focus of the study by Green and Ruff (2005) was on barriers to information seeking, which, following the terminology of the ISCM, may be seen as inhibiting factors. An example, showing how lack of adequate information resources can inhibit information seeking, is given in the following extract (Green and Ruff, 2005, page 178):

> *"It's often very useful to have one key clinical question and to answer it right on the spot because you need to act fairly soon … and you may not get back to that clinical question in a timely enough manner if you don't have the resources right there to be able to pursue that question."*

The content analyses of these five reports demonstrate the relevance and applicability of the ISCM in modelling physicians' information seeking behaviour. To prove the model's validity it is not necessary that all the facets of information behaviour represented in the ISCM should be demonstrated in every study. It is, however, important that any new coding terms arising during content analysis of a study's findings should be examined to determine whether they represent concepts that are not adequately covered by the model. During the initial content analysis a new coding term, "collaborative information behaviour", was used for the study by Reddy and Jansen (2008). To make it clearer that information behaviour may involve collaboration between users and to depict information sharing more explicitly, the model can be amended to show more than one "information user" box as in Figure 3, with a two-way arrow (arrow ⑦) to show information sharing between users. This revision also has the merit of showing the parallels between users and providers: just as there may be several providers, who may communicate with each other (arrow ⑤), there may be several users, who may communicate with each other (arrow ⑦).

The model shows the outcome of successful information seeking as actions or decisions. The "Actions Decisions" box is intended to represent examples of outcomes of information seeking. Another outcome may be filling gaps in knowledge: "Doctors had two dominant types of information need or search task: to solve an immediate defined problem (e.g., 'the best beta blocker to use for someone with heart failure') or to get background information on a subject" (Hughes *et al.*, 2010). To reflect this, the wording in the box can be changed to "Outcomes: actions, decisions, knowledge".

Finally, for consistency, it is appropriate to use similar wording in the two boxes referring to the handling of information. The model describes the handling of information received in communications as "Assess, use or ignore communication", whereas that for information found through seeking is "Assess and process information". The meaning of the latter can be clarified by changing the wording to "Assess, use or dismiss information".

The revised model incorporating all these changes is shown in Figure 3:

Figure 3. Revised information-seeking and communication model

The focus of these studies was on physicians as information seekers and users and so the findings have little to say about the model's representation of information providers – except in so far as an information user may also be a provider. Evidence about the model's relevance to information providers, their activities and the factors affecting them was obtained from the interviews with staff from NICE and pharmaceutical companies, the findings from which are summarized in the following section.

Information providers

As is the case for an information user, the ISCM suggests that contextual factors have a fundamental influence on a provider's information behaviour. Such factors include the environment and culture in which the provider operates. Related to the context are the provider's needs, wants, goals, perceptions and motivating and inhibiting factors. The model also indicates that the success of information providers in their communication activities and in achieving their goals depends significantly on the credibility and utility of the information they provide. Content analysis of the transcripts of the interviews with staff from NICE and from pharmaceutical companies confirmed the relevance of all of these factors and supported the validity of the ISCM as it relates to information providers. Key findings are summarized here.

As described earlier, NICE is a body established by the UK government to provide guidance on appropriate and cost-effective treatments and care in the National Health Service. The Charter for NICE describes its role: "The National Institute for Health and Care Excellence (NICE) is the independent organisation responsible for developing national guidance, standards and information on providing high-quality health and social care" (NICE Charter 2013). Thus to a significant extent NICE acts as an arbiter of what are the best treatments to be used in the National Health Service, where "best" takes into account assessments by NICE not just of a treatment's efficacy but, equally importantly, its cost: "All NICE recommendations are based on the best available evidence of what works, in terms of both clinical and cost effectiveness" (NICE Charter 2013).

The interviews with members of staff from NICE revealed the influence of this context on their perceptions, goals and communications. They referred to their perception of NICE as an independent source of "the best" evidence about clinical treatments. Their views in this regard are fairly summarized by the following quotation from Chidgey and colleagues at NICE: "NICE is the independent organization responsible for providing national guidance on the promotion of good health and the prevention and treatment of ill health ... Ensuring care provided is based on the best evidence available" (Chidgey *et al*., 2007). When asked about the goals of NICE, staff members referred in particular to the issuing of clinical guidelines and other information in order to advise healthcare professionals about what NICE considers to be the best treatments for particular conditions. A main objective of NICE in issuing guidelines and other communications is thus to influence healthcare professionals to manage patients in accordance with its judgement on what is appropriate and cost-effective treatment. Communications and information products such as clinical guidelines are produced to achieve this objective and a senior member of NICE describes such guidelines as "key to stimulating a change in practice" (Leng, 2014).

Interviewees also recognized, however, that the perspective of NICE may not be the same as that of an individual healthcare professional dealing with a particular patient, and that NICE may be seen by some doctors as operating in an "ivory tower" (Nowottny, 2014). When producing its information and guidance on a particular subject NICE involves experts in that subject area. The personal knowledge and experience of these specialists influence the guidance that they produce, but this may not take into account the working context of a general practitioner who may not have ready access to specialist equipment or services that are needed. Thus guidelines on clinical treatment may not always be easy to implement in general practice – because of time constraints, for example, or lack of resources (Straus and McAlister FA, 2000; Tracy *et al*., 2003). Gillian Leng at NICE has commented that "guidelines are not 'rules' – but it is important that a guideline is always considered, even if the recommendations are not then deemed appropriate in a particular individual" (Leng 2014).

These findings can be described in the terminology of the ISCM. The *information provider*, NICE, operates in its particular *provider's context* to produce information/guidance that is not always perceived by potential *information users* (general practitioners) as being practicable in their *information users' context* – in the ISCM's terms, the *utility* of the information is

relatively low. Lack of appropriate resources and time constraints in a doctor's working environment may be *inhibiting factors* preventing the implementation of guidance information. Consideration of the ISCM in this way can suggest possible solutions to the problems identified. Overcoming the inhibiting factors that impede the uptake of clinical guidelines might involve the provision of further resources for general practitioners but this would involve costs to the NHS and would not necessarily alleviate the time pressures under which GPs work. An alternative would be to improve the utility or relevance of guidelines to general practitioners. One way of doing this would be to increase the involvement of GPs in guideline development, and this has been suggested (Nowottny, 2014).

The ISCM highlights the importance of both the perceived credibility and the utility of information sources in the use of information. It was therefore interesting to find that all the interviewees at NICE expressed the view that information from the organization has a high level of credibility. Reasons given for this included the robust processes used to compile and evaluate relevant evidence, the involvement of experts and the independent standpoint of NICE. Leng has emphasized the importance of such perceived credibility, noting that dissemination of guidelines "could have almost no impact if the guidance is not seen to come from a credible, respected source" (Leng, 2014). However, interviewees also commented on the need to make guidelines easy to use or, in the ISCM's terminology, to increase their utility. To quote Leng again, "Guidelines are often long documents" and as a result they "can be challenging both in terms of identifying the most important areas for change and for tracking progress towards improvement" (Leng, 2014). In an effort to improve their utility, "NICE now uses guidance recommendations to generate a prioritised set of 'quality statements', which are concise, measurable statements designed to drive quality improvements across a pathway of care" (Leng, 2014).

In contrast to NICE, the operating context of the pharmaceutical industry is primarily commercial. Companies are in business to make a profit – without profits they will not survive – and a prime motivating factor for companies to issue information is their goal of promoting sales of their products.

In the interviews pharmaceutical industry staff talked about the communication activities of their companies. These may be proactive communications through advertising, the activities of sales representatives, company-sponsored information presented at medical congresses, training courses and the like. Such communications are often intended to "push" information about a company's products in line with its commercial goal to increase sales. Staff in marketing roles referred to promotional material and communications ("promotional messaging") designed to highlight the "benefits" of their companies' products and "drive uptake". In the words of a sales representative: "My role is to promote my company's medicines to health care professionals ... I have sales target that I have to meet" (http://careers.abpi.org.uk/case-studies/Pages/sales-representative.aspx). A major part of a company's communication activities is devoted to such promotion of its products and many staff members may be involved: "Medical reps visit doctors on a regular basis to tell them about their company's new products, and to answer any questions they have. Sales

managers, health economics experts, healthcare communication professionals and product managers all work together with the aim to promote new medicines for the benefit of patients" (http://careers.abpi.org.uk/working-in-the-industry/commercial/Pages/default.aspx).

Thus the commercial environment and goals of a company influence much of the information that it provides for physicians and other healthcare professionals. However, there are other important contextual factors apart from commercial goals that affect companies' information behaviour. The environmental context in which the pharmaceutical industry operates is heavily regulated. Companies' communications and activities must comply with legislation including in the UK the Human Medicines Regulations 2012, which regulate the advertising and promotion of medicines (http://www.legislation.gov.uk/uksi/2012/1916/contents/made). The industry's self-regulatory code in the UK (ABPI Code of Practice for the Pharmaceutical Industry, 2014) sets out requirements and standards for advertising, promotional activities and the provision of information to accord with the various legal requirements. The ABPI Code summarizes the essential requirements as follows: "companies must ensure that their materials are appropriate, factual, fair and capable of substantiation and that all other activities are appropriate and reasonable" (ABPI Code of Practice for the Pharmaceutical Industry, 2014, p.4). In the interviews companies' staff described how they review advertising and promotional material with the aim of ensuring that it complies with these requirements – that it is "accurate", "not ambiguous" and "can be substantiated by data". Thus a company's context or culture is not purely commercial: interviewees referred to their aim of maintaining high ethical standards as stipulated by the ABPI Code. They perceived their companies as having "ethical obligations" and a "responsibility" to patients to ensure that medicines are used "for the benefit of patients" and in the "safest manner".

Companies also produce information that is not intended to be promotional, such as: patient information leaflets included in medicine packs; the Summary of Product Characteristics (http://www.medicines.org.uk/emc/), which provides essential information about a medicine for healthcare professionals; and factual information supplied in response to enquiries from healthcare professionals, patients or others. Interviewees referred to the role of their companies' medical information departments (Robson and Riggins, 2001) in providing such information. It is a legal requirement that pharmaceutical companies should have a function responsible for co-ordinating factual information about their products. Within the European Union this requirement is specified in Directive 2001/83/EC, Article 98 of which states: "The marketing authorization holder shall establish … a scientific service in charge of information about the medicinal products which [the company] places on the market". Interviewees distinguished between the promotional and non-promotional information that a company produces, noting that the former focuses on the "benefits" of the company's product whereas the latter is more balanced.

In ISCM terms the legal requirements and those of the industry's code of practice as well as ethical considerations can be seen as inhibiting factors which influence companies' communication activities and moderate a purely commercial approach to information provision.

Interviewees spoke about the influence of perceptions on their companies' information behaviour and on that of healthcare professionals who use that information. With regard to the former, interviewees talked about their companies' market research activities, which they carry out "in order to understand unmet needs, understand what information is most relevant". In other words, companies put considerable effort into gaining an accurate perception of healthcare professionals' information needs with the aim of producing communications and advertising that have relevance to those needs and thus have high utility. Some interviewees talked about "two-way dialogue" between companies and doctors, particularly through field-based staff such as sales representatives and medical science liaison staff, again with the aim of improving companies' perceptions of their needs. These perceptions of physicians' needs have a major influence on the information that companies provide and how they communicate it.

The perceptions that healthcare professionals have of the pharmaceutical industry were also raised. As one interviewee put it, companies are perceived to be "only trying to make money". Because of the industry's commercial goals, there is a perception among health care professionals that information from the industry has less credibility than that from sources such as NICE. Information from NICE is viewed as being more trustworthy because it is perceived to be "independent".

Analysis of the interviews with staff from NICE and those from pharmaceutical companies confirm the influence of context, goals, motivating and inhibiting factors on these information providers' behaviour as suggested by the ISCM. Both the internal context (including the "independent" standing of NICE and the commercial nature of companies) and the external context (including legal requirements) are relevant. The findings confirm the influence of perceptions on information behaviour, including providers' perceptions of themselves, their perceptions of the needs of the information users to whom they communicate and the users' perceptions of the credibility of the providers and the information they produce. The findings also highlight the importance of the utility of information from the perspective of the users.

Discussion

The Information Seeking and Communication Model was developed to be more comprehensive than most previous models of information behaviour by explicitly taking into account both information users and information providers and with the aim of having wide applicability. The findings from the research described in this paper provide support for the validity of ISCM as a model of the behaviour of both users and providers of information in the field of healthcare.

According to the ISCM the information user's context, including the working environment (role, tasks, resources available, time pressures, culture and other factors) and personal environment (knowledge, training, experience, psychological and other factors), plays a central role in the user's information behaviour. It not only stimulates the user's information needs, it also colours the user's perceptions of himself or herself, of others and of information

and sources. Context also influences motivating and inhibiting factors that encourage or discourage the user when deciding whether or not to seek information. In the model the utility and perceived credibility of information and sources are particularly important factors affecting the user's choice of sources and use of information.

The literature review of information seeking and use by physicians and the content analysis of five detailed studies of hospital physicians and general practitioners demonstrate the relevance of all of these factors. A physician's information need is related to his or her particular context including experience, working environment and role – for example as a junior doctor, general practitioner, specialist, or as a member of a hospital team (Bennett *et al*., 2005; Davies, 2011; Masters, 2008; Reddy and Jansen (2008). Physicians' perceptions of their own knowledge and their confidence in their use of information resources affect their information seeking behaviour (Bennett *et al*., 2004; Cullen *et al*., 2011; Fourie, 2009). Motivating factors that encourage physicians to seek information include the urgency of a patient's problem and a belief that an answer to a question exists (Gorman and Helfand, 1995; Reddy and Jansen, 2008). In contrast, workload, lack of search skills and doubt about the existence of relevant information are inhibiting factors that may discourage information seeking (Davies, 2007; Ely *et al.,* 2005). The importance of credibility in the choice of information sources used by physicians is confirmed in the literature (Hughes *et al*., 2010; Revere *et al*., 2007) and utility has also be shown to be a crucial factor – physicians may use information because it is easy to access rather than having a perceived high level of credibility (Curley *et al*. 1990; Prosser *et al*. 2003).

Mirroring its representation of information users, the ISCM also highlights the fundamental influence of contextual and related factors on the behaviour of information providers. Content analysis of the transcripts of the interviews with staff from NICE and from pharmaceutical companies confirms the importance of these factors and endorses the relevance of the model to these different information providers.

NICE is a public body established by statute to provide guidance and information to NHS healthcare professionals and others about appropriate treatment and care of patients and about social care. Within this context NICE is perceived by its staff and by healthcare professionals as being an "independent organization" and a source of "the best evidence available" about healthcare (Chidgey *et al*., 2007). A key goal is to influence healthcare professionals to manage patients in appropriate and cost-effective ways. To achieve this goal and to drive changes in clinical practice it produces communications such as clinical guidelines (Leng, 2014). The guidelines and other information that NICE issues are perceived to have high credibility but their utility has been criticized for sometimes being too long (Leng, 2014) or for not being practicable, some healthcare professionals regarding NICE as operating in an "ivory tower" (Nowottny, 2014).

The commercial context of the pharmaceutical industry with its goal of selling its products leads it to produce promotional communications that are very different from those of NICE and which highlight the "benefits" of the company's products in order to "drive uptake".

However, the industry's communications and information are also affected by other factors in the environment in which it operates, notably legislation such as the Human Medicines Regulations 2012 and the industry's code of practice. These specify standards that companies must meet in their information and promotional materials and activities. The legal and code of practice requirements act as inhibiting factors moderating the claims that companies make about their products. Nevertheless, because of companies' commercial goals, information that they produce is perceived to have lower credibility than that from sources such as NICE. On the other hand, companies make efforts to ensure that their information has high utility by finding out what is useful and relevant through market research.

The model depicts a two-way flow of information, as shown in Figure 2 and by the exchange of information between providers represented by arrow ⑤ in Figure 3 or between users represented by arrow ⑦. This shows the user and provider roles as interchangeable with a user acting as a provider and vice versa. This aspect of information behaviour was demonstrated in the study of Reddy and Jansen (2008), which reported that physicians and other health care professionals may act in collaboration to seek information, share it and use it together. Another example arose in interviews with pharmaceutical industry staff who referred to "two-way dialogue" between companies and physicians.

The ISCM is not intended to give a detailed representation of every aspect of information behaviour. It does not, for example, describe the steps involved when a user assesses and processes information or when a provider produces information products. As with other models, the aim is to highlight important elements of the process being modelled and the factors affecting them. It is hoped that by drawing attention to the features of information behaviour it will have practical value in helping users and providers to review and improve how they seek, use and communicate information. From an information provider's perspective, for example, the model emphasizes the importance of the utility and credibility of the information provided. The findings about NICE from this research suggest that it is important to ensure that clinical guidelines have high utility – that they are easy to use and are relevant to the healthcare professionals for whom they are meant. It has been suggested that there should be greater involvement of GPs in the development of guidelines to ensure their relevance to general practice (Nowottny, 2014). NICE has also recognized the importance of ease of use and it now issues concise "quality statements" to guide improvements in care (Leng, 2014). The findings about the pharmaceutical industry suggest that the utility of the information that it provides is often high in that it is easy to obtain, particularly through sales representatives – doctors may find representatives "an expedient means of acquiring and processing drug information and keeping up to date with new products" (Prosser *et al.*, 2003). However, the perceived credibility of information from the industry is not as high as that from independent bodies such as NICE. It may be difficult to change physicians' views about advertising as an information source but companies could make them more aware of the non-promotional information services that they offer. Most companies have medical information departments that have the responsibility of answering requests from health care professionals (Robson and Riggins, 2001) but it is doubtful that

many physicians are aware of them and how their role differs from those of the companies' sales and marketing departments. Increasing numbers of companies now recognize the value of such a service and are introducing the relatively new role of medical science liaison specialist, involving staff who visit health care professionals to provide non-promotional information and to answer questions (http://www.msla.org.uk/). Such services must demonstrate their credibility – their trustworthiness and reliability – by operating to high standards such as those set out in the industry's UK code of practice (ABPI Code of Practice for the Pharmaceutical Industry, 2014).

In summary, the findings of this empirical research endorse the validity of the Information Seeking and Communication Model. By developing the model on insights gained from earlier models and by, in part, using the findings from published studies of physicians' information behaviour to test it, this work answers criticisms that LIS research fails to build on previous research (Wilson, 1999). Furthermore, by demonstrating the relevance of the new model, the research also endorses the value of the earlier models. The ISCM has practical value and can provide useful insights into information behaviour and suggest ways in which information users and providers may improve the ways in which they work. It thus answers criticisms highlighted by Case (2012, pages 370-371) that LIS research lacks practical usefulness.

Use of the ISCM for practical research as described here also deals with another issue concerning studies of information behaviour. Case and O'Connor (2015) note that the focus of such studies has tended to be on information needs and seeking, with less emphasis on the uses to which the information is put. They comment: "Given the high frequency with which the HIB [human information behaviour] literature employs the term *use*, the lack of attention to the outcomes of seeking is unusual". The ISCM refers to outcomes of information seeking and acquisition: actions, decisions, knowledge. It may thus prompt researchers to consider how information is used and its effects, rather than focusing simply on the processes of information seeking or communication.

It is hoped that the practical use of the ISCM will be further investigated in other information domains.

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