Part Eight
The human factor

Next week
Strategic uses of IT
CLOSING THE COGNITIVE GAPS: HOW PEOPLE PROCESS INFORMATION

We often use "information" described as a "resource." This implies that information is a "thing" that resides in documents, information systems or other artifacts. The information is assumed to be constant, unchanging, its meaning is fixed by its representation in the artifact. A complimentary view is to look at information not as an object but as the outcome of people constructing meaning out of messages and contextual information residing not only in documents but in individual minds. Individuals actively create the meaning of information through their thoughts, actions and feelings.

When we treat information as an object, we are concerned with how to acquire the information that we need, and how to represent the information that we have. The challenge then is that of how to use the information.

When we treat information as constructed by people, we are concerned with understanding social and behavioural processes through which information is created and used. The social settings in which information is encountered determine its value. Full understanding of information-seeking as a social behaviour helps us design better information processes and information systems.

As shown in Figure 1, we can divide information seeking into three processes: experience of information needs, information searching, and information use. In this article, we will examine the cognitive, affective (emotional) and situational factors that influence each of these processes.

Information Needs

Since the second world war, many studies have attempted to understand how different groups of people, including scientists, engineers, doctors, academics, civil servants, managers and public sector employees—experience and meet information needs. A convincing model of such behaviour is the "sensational" model developed by Brenda Davis of Ohio State University.

In the seminal work, a person moves through an information seeking process, taking steps that are experienced. As long as he or she can make sense of these experiences, movement ahead is possible. But time to time, movement is blocked by the perception of a "cognitive gap"—a situation that the person is unable to make sense of. To bridge this gap, the person seeks information to make sense of so that he or she can move on.

Dervin and her associates have completed over 50 studies in the past two decades based on the "sensational" approach. Their research suggests that the ways in which people perceive cognitive gaps and the ways that they want information to help are good predictors of their information-seeking behavior. Better yet, the ways people define these gaps fall into categories that apply across different groups of information users. Dervin has identified eight such categories (see Table 1).

Cognitive needs are as much felt as thought about. When sense runs dry, the lack of understanding creates uncertainty. Carol Kuhlthau of Rutgers University, New Jersey, has found that uncertainty causes anxiety, apprehension, confusion, frustration and lack of confidence, among other symptoms. These affective states in turn direct the way people seek and use information.

Information seeking

Experiencing information needs may lead to information seeking. This resembles a problem-solving or decision-making process. An individual identifies possible sources, selects which ones to use, locates or makes contact with them, and interacts with them to obtain the desired information.

In today's rich information environment—where human attention is a scarce resource—how do people allocate time and energy when searching for information? Research suggests that they weigh the amount of effort required to use a source against its anticipated usefulness. This cost-benefit evaluation is affected by the individual's personal interest and motivation, and by the complexity of the task at hand.

At the cognitive level, an individual's selectivity a source that he or she considers most likely to provide relevant, useful and helpful information. Relevance and usefulness in turn may depend upon how up-to-date and comprehensive the information is. Another important factor is the perceived reliability of the source. Research into information seeking often groups some or all of these attributes under the rubric of "perceived source quality" in order to examine their effect on source use.

At the affective level, an individual's personal interest in a problem determines the amount of energy he or she invests in seeking information. Carol Kuhlthau has noted that as information searches progress, initial feelings of uncertainty and anxiety fall as confidence rises. If a clear theme is developed to focus the search, the individual may become more highly motivated.

Drawing on social learning theory, Tom Wilton argues that since a feeling of personal mastery about using a source leads to greater use of that source, doubt about one's ability to use a source conversely lead to that source not being used. This may be the case even if the source is per
Information use

Just as there are eight categories of information need, Brandon Travis and Robert Taylor propose that there are eight general categories that describe how people use information: to develop a context, to understand a particular situation; to know what to do and how to do it; to get the facts about something; to confirm another's use of information; to project future events; to motivate or sustain personal involvement; to develop theory or relationships and social status or personal fulfillment.

An individual's cognitive style and preferences affect the way he or she perceives and uses information. A number of classifications have been developed to differentiate perceptual types and cognitive process patterns. A widely used method is the Myers-Briggs Type Indicator (MBTI).

Another common cognitive style variable is "field dependence." Field-dependent individuals respond to the environment as a whole, whereas field-independent people orientate themselves correctly in terms of environmental cues. Daniel Kahneman (Princeton University) and Amos Tversky (Stanford University) have discovered that when people use information to make judgments they take cognitive shortcuts to make the information easier to process. Unfortunately, these simplifications are fallible.

For example, when a plane crash at an event belongs to a given category, people rely on mental stereotypes, but they often ignore other relevant information, such as the distribution of categories in the population. To judge the frequency or likelihood of an event, people over-rely on recent, vivid, easy-to-recall information. To estimate a quantity people make adjustments to an amount initially measured or suggested, but these adjustments are often inadequate.

At the affective level, people avoid using information that arouses strong negative emotions in others or in themselves. People use information selectively to avoid embarrassment, conflict or regret. These cognitive and emotional barriers to enhance personal status or reputation.

For example, when making decisions, makers will positively evaluate and continue a course of action even when the available information indicates that they should withdraw to cut their losses. One psychological factor behind such "escalation of commitment" is the desire to save face; decision makers persist because they do not want to admit to themselves that they have made an error. In organizations where error-free decision making is valued, employees may be reluctant to voice their mistakes or postpone their discovery.

Another example of using information selectively to minimize unpleasant feelings is the "invented-here" syndrome where the tendency of a large group of people to reject new ideas from outside. Over time, people increase the amount of order in the system by further work environments to reduce stress and uncertainty. As a result, the longer individuals have belonged to a group, the stronger their traditional attachment to, and beliefs and decisions that they help create, and the more resistant they are to ideas from outside.

As far as situations are concerned, the norms and rules of the group, profession or organization can influence the way information is perceived and used. For example, Irving Janis of Yale University has observed how highly cohesive groups are susceptible to the groupthink phenomenon. He has found that when group members seek concurrence to such an extent that they choose to ignore or undervalue information that threatens group beliefs and solidarity.

Donald Schon of the Massachusetts Institute of Technology has investigated how professionals develop their own languages, values, overarching theories, and role definitions. Members adopt these as frames of reference through which information is processed to explain and relate reality, and to reflect professional identity.

Further reading


Implications for practice

The discussion here suggests several ways to improve information management:

1. Design information systems not just to answer queries but to provide useful information that will help people solve work-related problems and deal with the specific requirements of problem situations.

2. Increase awareness of the nature of human information seeking and processing; this involves understanding cognitive biases and emotions, and the ways that routines and emotional differences can block learning.

3. Educate everyone in information quality and information quantity.

4. Develop an organisational culture that values and encourages employees to question the quality of information they receive.

Quality versus accessibility: how chief executives keep up to date

Most studies of how people use information sources have found that a conscious search for specific information is the least likely to be used or not. For example, scientists, engineers and managers are often sensitive to source accessibility, so that a library or information centre on the next floor or even a few offices away may be intrinsically valuable, even though people recognize that it contains more complete and up-to-date information than their closer hand sources.

However, a recent study of how chief executives in the Canadian telecommunications industry use their business environments for information about trends and developments found a different pattern. For these chief executives, the perceived quality of a source (in terms of reliability and relevance) is an important predictor of whether it was used or not. For example, scientists, engineers and managers are often sensitive to source accessibility, so that a library or information centre on the next floor or even a few offices away may be intrinsically valuable, even though people recognize that it contains more complete and up-to-date information than their closer hand sources.

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