# Interpreting Knowledge in Information Science

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## Contents

## Summary

The paper deals with new challenges of information science as social science and mutual relationships with the new discipline of knowledge management. Qualitatively new approach argues that more concentration on knowledge interpretation is needed. Knowledge interpretation links both information science as a strategical paradigm and knowledge management as corporate knowledge framework. A knowledge interpretation framework has been outlined icluding a series of spiral processes from perception to understanding. Based on knowledge interpretation background general model of information product has been proposed. Main components of the model (cognitive, semantic, value, communicative, technological) have been described and resulted into a proposal of a new methodology for generation of information products. It is concluded that knowledge interpretation framework and model of information product can be used for further development of  theory, research and education of information professionals and knowledge managers.

## 1. Introduction

The paper is aimed at research of knowledge interpretation as part of knowledge management pointing to links to design and communication of information products. The core concepts which we use in the paper are: information science, knowledge management, information society, interpretation, knowledge, information, knowledge representation.

In our view, information science is a social science merging social, human and technological issues of generation, communication and use of knowledge in society. Knowledge management can be viewed as a set of actions and processes covering identification, retrieval, creation, distribution and use of knowledge in organizations and social and subject domains. Although knowledge management is generally a part of corporate management, we would like to point to the crucial developmental links with information science, namely knowledge objectives, knowledge identification, acquisitions, knowledge storage, dissemination and application, which form the part of special knowledge culture not only within organizations, but also in wider social context of information science.

Both knowledge management and information science can be based on the role of human resources connected with knowledge, while information and communication technologies play an important and positive part in the cycle of information and knowledge transformations. Human interaction and social communication form the key to creating knowledge from information.

Information society is a society driven not only by information technologies and services, but especially by knowledge usage in social groups, subject domains and organizations. Knowledge representation can be explained as special ways of structuring knowledge aimed at its storage, retrieval and use. Cognitive research in information science shows that specific pieces of knowledge captured e.g. in various types of documents, include more meanings in various contexts. All these meanings form a basis for polyrepresentation of knowledge (Ingwersen, 1995). Since linear representation is not enough, we have to develop means for representing multiple meanings in various contexts and possible situations of knowledge use.

For the purpose of this paper knowledge can be explained as structured and generalized product of human mind including concepts, views, images, experience and know-how. Based on this information can be viewed as knowledge expressed in semiotic systems for communication with conventional meaning that can change the state of knowledge (of a recipient). Information and knowledge are then interrelated through multiple cycles of transformations.

What is then the position of interpretation within these social and human processes? I suppose that interpretation is connected with generation of meaning for specific pieces of knowledge. This process can be directed by rules and values (and their systems), which can be even institutionalized (e.g. libraries and information systems, bibliographic or cataloguing rules). Another assumption is that interpretation as "seeking meaning" (Kuhltau, 1993) should be paid more attention to. The reason is a need for seeking new ways of response to global societal changes and communication patterns. Changes are also required in theory, education, practice, attitutes to technologies, culture and human resources. These assumptions will be elaborated on in the following text.

## 2. Information science at crossroads of technology and culture

New views of information science have been arisen by the concept of information society. Apart from quantitative growth of knowledge, the development of successively digitalized knowledge universe has been marked by gradual integration at both quantitative (spatial, local networking into larger geographic setttings) and qualitative levels (integrating various knowledge forms, e.g. in multimedia). As a result the quality of potential knowledge use represented by its possible individualization (from the viewpoints of cognitive processes, problem types, creativity, professional and social activity) has been emphasized.

Current information science explains new relationship between reality and its reflection, which has been mediated by representation of knowledge (e.g. bibliographic records). With the development of new technologies this relationship becomes non-linear, using new tools and languages of representation, like e.g. semantic networks, productions rules, frames, etc. Many new hybrid languages of knowledge representation apply the principles of fragments of know-how reminding us of human thinking. Thus, information science follows at least two issues: 1. very complex (technological) tools for knowledge representation, and 2. very simple ways of user interaction with knowledge in terms of identification, retrieval, access. Historically, this relationship has developed as rather linear one (the more complex tools for represenation, the simpler ways of interaction). But still, the main issue for knowledge management and information science has been left open, namely the issue of the knowledge use and knowledge interpretation (which can be accessed or retrieved rather easily).

It should be noted that it is not easy to explain these issues, as they are highly interdisciplinary, covering intersection of psychological, sociolinguistic and epistemological approaches. But they are vital for transition to deeper meanings and knowledge understanding. Many implicit philosophical traditions can be here discovered (e.g. objectivist, subjectivist, individualistic or socially oriented, Hjorland, 1998). This work cannot analyse them, but I believe that the dominant positivistic approaches are not sufficient. My approach combines objective knowledge principle (K. Popper) with social activity and the role of cognitive processes in interpretation. I believe that meanings are both individual and social (cultural) in cycles of interpretation. Using knowledge management terminology, these processes form a spiral changing tacit knowledge to explicit knowledge and again to tacit knowledge, etc.

I believe that from present philosophical streams global, integrated theories are relevant, because they oppose the rationalistic tradition of one (ordered and stable) universe against the multiverse as space of multiple worlds and multiple potential interpretations. And this should be true for both knowledge management and information science. While information science offers philosophical and general scientific paradigm for justification of this approach, knowledge management brings its corporate and organizational framework including social, professional, subject or product domains.

Information science integrates technological advances into new culture of human mind and social acitivity. That is why information science and knowledge management can be metaphorically placed at the crossroads of technologies and culture, while the use of technologies enhances the access to and use of knowledge and gradually forms a new culture of knowledge society.

## 3. Issues of knowledge interpretation

Interpretation is a process of seeking meaning of information through various transformations and representations. Without conventional rules and values applied to knowledge it would not be possible to generate meaning for particular situation. When information scientists apply these rules and values to knowledge, they form its context. In fact, they create the added-value to the acquired knowledge. (e.g. as corporate resource). In these contexts we can apply the semiotic principle stating that a term alone does not mean anything, the meaning is conveyed by term relationships which form the context (Saussure).

Knowledge interpretation can also be seen as a product of knowledge transformations including knowledge representation tools. So the specific creativity of information professionals is knowledge production usually based on special interpretative framework, e.g. conceptual scheme, common standards and values of measurement of prospective knowledge use. Information science should offer a basis for various frameworks of this kind. The question is how to bind together various pieces of knowledge in order to form a special comprehension viewpoint.

Following the analysis of the evolution of different ways of representing and transforming knowledge I propose a general framework for understanding knowledge interpretation. This framework emphasizes the processual approach (processes of perception, assessment, inference, validation, understanding, action) and is briefly outlined in the following paragraphs.

If we follow the theory of interpretation (P. Ricoeur) we can trace at least two dimensions of  a piece of knowledge, the first dimension being the meaning, and the second one the event marked by personal experience and communicative situation (e.g. dialogue). The situation includes several components like objects, states, things and facts. Knowledge interpretation is a spiral limited by two boundaries: 1. perception,  and 2. understanding. Between these two boundaries a series of processes can be distiguished. At the beginning of understanding the process of assessment occurs (possible multiple meanings), then multitude of justification or verification processes follow. These justification processes imply the comparison of several asssessed meanings (polyrepresentation) to a set of criteria derived from the event connected with the given piece of knowledge. Several cycles of comparison lead to validation and confirmation of the most probable meaning. This is connected with explanation of meaning and the following understanding (which can again be followed by explanation). Explanation is the means of mediating in the process of interpretation. Final understanding is then concluded by adoption of the meaning not only with individuals, but also with social and professional domains and organizations.

The crucial processes in this interpretation framework are assessment and validation. Logical probability of the true conclusion (concerning the meaning of a piece of knowledge) forms the basis for proving the interpretation for specific situation. As an example we can mention the text analysis, at present influenced by transfer of the characteristics of small language units (phonemes, morphemes) to larger units (sentence, paragraph).

This framework has been just outlined and should be enriched by principles of knowledge segmentation and integration including the role of analysis, synthesis, inference and action as part of knowledge production. Anyway, the framework can be used for further research in information science development for information society.

**4. Position of interpretation in knowledge management**

Knowledge interpretation as a series of transformations represents a basic source of creative thinking. That is why it is, in my view, so valuable for (corporate) knowledge management within the integration of external and internal (human) resources. It is so because the intersection of  technologies and knowledge in its cognitive and social parts takes place in organizations and form a new culture (e.g. corporate products or services).

For this difficult task general knowledge on interpretation can be beneficial. Knowledge managers should know that knowledge interpretation includes the creation of a <u>tentative conceptual model</u> (e.g. by analysis of information sources) and its multiple (spiral)<u> transformation</u> to a final conceptual model. If one strives for efficient knowledge management, then it is necessary to take into the account not only easily-formalized processes of knowledge acquisition, storage and retrieval, but also human and semiotic basis of knowledge interpretation.

 The position of  knowledge interpretation can be explained by its <u>production component.</u> I suppose that a general term of information product could be helpful in this context. Information product is determined as any result of creative knowledge interpretation which comprises the added value to analysed information sources. However, it is important to discriminate the level of the added value as a result of creative analytical, synthetic and interpretative processes. In information science a methodological ground for these products has been developed with typical provision of context (metainformation). As examples of these products we can name study analytical reports, state-of-the-art reports, reviews, argumentation essays.

 In generation of information products we can distiguish five basic <u>phases of interpretation</u>:
1. perception, contact with new infomation,
2. selection, driven by pattern recognition and validation of criteria,
3. inference, merging of categories, derivation of meanings,
4. prediction, transfer out of limitations of interpreted information,
5. action (creation of a mind product).

In this respect knowledge interpretation includes semiotic (social, domain or professional) conventions and human issues of creative personalities like thinking, feeling and acting, learning and experience. Semiotic conventions usually refer to the categories of size, spatial placement and orientation, static and dynamic objects, blank spaces, etc.

Thus, knowledge interpretation is needed more and more for corporate development and for theoretical paradigmatic shift in information science research. Its position is visible through information products. Information products represent the stress on knowledge in information society, when new organizational structures concentrate around knowledge structures. The problem is that knowledge can never be so stable that its structures will be definite, but technologies have made it possible to change the traditional library concentration on physical objects (documents) and it is the first step to deep institutional changes in communication and information processes. Traditional classification and indexing theory can help form the basis for knowledge structures studies, changing the tacit knowledge to explicit knowledge.

## 5. Model of information product for support of knowledge interpretation

Based on this background I have developed a model of an information product as a result of knowledge interpretation. The model is composed of three viewpoints: representation of meaning, significance of cognitive processes, social standards and values in professional and social communities.

Information product determined by the use of knowledge by users of information systems and services includes five components:
- cognitive component
- semantic component
- value component
- communicative component
- technological component.

These components form the model of information product (fig.1) in the framework of knowledge management. It is based on an assumption of the maximum level of creative interpretation in knowledge production. All the components in holistic cooperation produce the context for better use of knowledge. The cognitive component comes from cognitive processes, knowledge typology and cognitive styles including their emotional and social part. The semantic component includes especially conventions of conceptual structuring and of sign assignment and perception. These conventions are dependent on relationships between the meaning and the situation (event). The component of values is connected with possible ways of knowledge use and the degree of context. The interpretation framework described above leads to the added value as the focus of the value component. The communicative component includes communicative styles connected with the design of information product for particular professional, social or subject and domain groups. As opposed to the traditional provision of information the emphasis is laid on the support of problem solving and decision-making for special user groups. The technological component

supports knowledge representation and design based on features of segmentation, ordering, use of patterns, etc. in order to make the perception and use of knowledge easier, efficient and beneficial to corporate and social development.

The technological component of the model is the most dynamic part and changes are more difficult in direction upwards to cognitive component. As for the level of knowledge interpretation, the deepest level can be found with the cognitive component and through other components this level transforms to simpler, surface forms.The model can be validated through other significant criteria like knowledge representation (e.g. simpler ways with interactive components, more complex towards cognitive components), degree of analysis and synthesis, knowledge transformations, etc.

Based on the model I have also developed a methodology for the information products generation (Steinerová, 1998). Here, the components are represented by series of questions (for information professionals as producers of information products). For example, how to define the problem or subject, to set the criteria and the gist, how to identify conceptual structure (the cognitive component), or what is the insight, validity, contradictions, quality, viewpoint, etc. (the value component), or what is the level of subject coverage and user inclusion, how to transform knowledge, what is the context, relationships (the semantic component), or what are the communicative conventions, preferred user stereotypes, how to rearrange the conceptual structure (the communicative component), or what design and style is beneficial for the given situation, how to arrange, filter, visually represent, etc.(the technological component).

I regard this model as part of a new methodological framework for information science. Evolution of information science to a new paradigm shows that the cognitive, historical and social approaches are not contradictory, but that they are part of a "multiverse" of methods for creative production of information products by new information professionals.

## 6. New information professionals

What are the implications of the knowledge interpretation issues for new information professionals, especially with respect to their education? First, they should be aware of the importance of interpretation for knowledge management in new information institutions. Their professionality should be connected with particular information products which they produce in information society. I suppose that the profession is linked with creativity, with value-added processes and the use of knowledge for problem-solving in cooperative social relationships.

Based on our analyses and interpretational framework the requirements for professional and personal competencies of information professionals and knowledge managers comprise two groups of competencies: 1. analytical and interpretational competencies, 2. competencies linked with interaction between

external and internal knowledge. Both groups are focused on intellectual activities connected with patterns of efficient knowledge organization and use. From the perspective of knowledge management three aspects of interpretation have to be incorporated into education : 1. representation of meaning by sign systems (semiotic approach), 2. mechanisms of cognitive processes (psychological approach), 3. social rules (conventions) in social systems (sociological approach). It is also necessary to include skills connected with diagnosis of information needs of users within a continuous dialogue.

Technological and communicative skills form a general background for education of information professionals. General management issues are also embodied in requirements for business skills (including e.g. understanding of financial management, fundraising, entrepreneurial skills, change management, project management). Professional skills should concentrate on knowledge organization, document design and repackaging and navigation skills (for information retrieval). Understanding knowledge and social communication are, however, the most important conditions (namely the problems of generation, development, transfer, interpretation of knowledge, motivation, knowledge audit, corporate culture, human behaviour and interaction, etc.).

Education for new information professionals (e.g. knowledge managers) should not be based on technological skills, but on methodology which can develop and support creativity of knowledge use and interpretation, sound critical judgment and a lifelong ability to learn. This has been proved by surveys at our Department (1996, 1997) aimed at directions of manpower market development in information science and knowledge management in Slovakia. Of course, the education will have to be open, flexible and modular.

A potential image of a new information professional can be described as follows: He should be able to determine the information needs including contexts of problems. He would also need to know how to set a strategy for identification and access to information sources, how to assess and select knowledge from them. He must be interested in the best ways of knowledge organization for different problems, conceptual structuring and seeking meaning. The best way and form of information packaging for the user is also significant for him. For this he needs to know about physical an intellectual mechanisms of information storage and retrieval. And for practical activities he needs knowledge about communicative techniques, the project, time and change management.

I suppose that a future information professional will be institutionally-independent (e.g. specialization in subject domains, professional groups, etc.). His activities will also include consulting and teaching integrated into support of knowledge use. He will have to understand the ways of transforming information to knowledge, characteristics of user groups, factors which determine information needs, methods of conceptual modelling and creative problem-solving.

Interpreting knowledge is the key process within the professionality of new information professionals (knowledge managers). Knowledge interpretation as part of creative problem solving contributes highly to the corporate and social success

and further development. New courses in information science should take into the account these requirements.

## 7. Conclusion

Knowledge interpretation has not been paid much attention in information science and knowledge management so far, because it is a complex intersection of multiple aspects. However, if information science should advance in theory, the transition from formal, descriptive methods to deep, conceptual analyses and a new coherence of recorded knowledge is inevitable. The specific professionality of future information workers will be based on generation of the added value using analyses, syntheses and interpretation. I believe that interpretation can ensure the value of information products created by information professionals.

Transition to a deeper meaning of knowledge is made possible by various types of contexts reflected in conceptual structuring as part of knowledge interpretation. Our knowledge interpretation framework and model of information product can be used for further development of education and methodology of information science. Within our curriculum we have developed new courses proposals and a textbook (Steinerová, 1998) based on these approaches and aimed at further improvement of the information professionals education for future.

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Fig. 1          INFORMATION PRODUCT MODEL

| Knowledge interpretation | Components of an information product | Change |
|---|---|---|
| DEEP COMPLEX<br><br><br><br><br><br><br><br><br>SIMPLE | **COGNITIVE COMPONENT**<br>cognitive styles<br>types of knowledge | SLOW |
| | **SEMANTIC COMPONENT**<br>conventions of meanings, signs<br>conceptual structure | |
| | **VALUE COMPONENT**<br>degree of metainformation, context<br>the added value | |
| | **COMMUNICATIVE COMPONENT**<br>communicative styles, subject domains<br>social groups, corporate, professional groups<br>design | |
| | **TECHNOLOGICAL COMPONENT**<br>representation and presentation styles<br>form, medium, type of technology | FAST |