

INFORMATION RETRIEVAL *I*NTERACTION

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Chapter 9

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The discussions in this book demonstrate that information retrieval R&D develops into three fundamental approaches, a classic or traditional, a user-oriented and a cognitive approach. This tripartite taxonomy characterizes the different goals and foci displayed during three decades of IR research activities. Currently, all three research views run in parallel, and one may conclude that by being preoccupied with the retrieval processes in IR systems, the traditional approach demonstrates the most profound paradigmatic force retrospectively. However, it is undergoing changes towards understanding and modelling of domains and users, in order to produce innovative IR concepts and ideas.

Also the user-oriented approach is increasingly turning toward more cognitive and behavioural aspects of IR interaction situations, directly aimed at interface design. The emerging cognitive approach to IR research is seen as a natural extension of the two prevailing IR approaches, gradually integrating into one. It walks hand in hand with recent developments in the field of artificial intelligence and systems science, attracting scholars from both fields and IR.

A second aim of this book was to investigate and discuss the role of intermediary mechanisms in IR interaction. Empirical as well as analytic evidence clearly demonstrate the central position of the intermediary. Regardless of whether in a partial match or an exact match environment, effective IR performance requires an adaptive and supportive component that may mediate conceptual structures as well as models of one another from user to underlying IR systems and information sources, and vice versa. One may conclude that the fundamental role of the knowledge-based intermediary mechanism is to provide the actual user with adequate and sufficient means to use *his own* intelligence, associative power, and decision making capabilities during retrieval.

Hence, a third aim became to construct a global framework of intermediary functions. The *Mediator Model* is deeply indebted to previous and contemporary results of colleagues, combined with the author's own empirical investigations and

analytic contributions. By considering *all* the participating knowledge structures in the entire IR interaction process, and isolating the fundamental knowledge elements internal to an intermediary, Mediator evolves around 13 integrated functions on three levels, and 54 sub-functions.

The underlying principles refer to the concepts of adaption, supportiveness and transparency. In addition, the Mediator Model is intended to be applied to complex domain and IR environments with a variety of users involved in information retrieval. These principles are illustrated by its three-level construction. Ideally, total adaptability involves interaction with the actual user, *as well as* actual model building of (often remote and rather unknown) IR systems. Without a degree of adaption and transparency, a supportive user modelling approach to intermediary design cannot be achieved in complex domains. From a cognitive viewpoint the alternative 'intelligent IR' approach is unachievable if its aim is to make intelligent retrieval by the mechanism itself. The reason is that a 'drop' constantly takes place from a cognitive, human and intelligent level *outside* the system, down into a monadic, structural or contextual level of information processing, metaphorically speaking, *inside* the system. Since information goes beyond meaning, even full-proof machine translation will not get IR research further.

Hence, user and request modelling, as well as other functions leading to inference are primarily seen as integrative instruments for providing dedicated and structured *feedback* of a conceptual nature to support the user on his cognitive level.

Because of their holistic characteristics the Mediator functions are viewed as building blocks that may be added together according to specific design objectives. The framework is thus recommended primarily to serve as a tool for analysis, design as well as assessment of intermediary mechanisms and IR products.

The discussions in previous chapters concerning the differences between the cognitive view, hermeneutics, and cognitivism demonstrate clearly the more comprehensive scope underlying the cognitive viewpoint. Based on this epistemological view, it is the author's opinion that fruitful prospects exist to generate an IR theory founded on the idea of acceptance of contextualisation and uncertainty in IR, which may provide a unifying framework for further progress of the field. To this end, the author has found it essential to propose a refined concept of information for information science, which introduces conditionals as to when to talk about information, on both the sender and the recipient side, at the event of information transfer.

Although certain differences exist between hermeneutics and the cognitive viewpoint, the major incongruities being concerned with the interpretations of the concepts of 'representation' and 'cognitive models', the cognitive viewpoint in IR is seen as closely related to hermeneutic philosophy. The comprehensive nature of the viewpoint is founded in its explicit recognition of cognitive structures embedded in information systems. Consequently, the viewpoint, as well as the cognitive approach to IR research, cannot and will not exclude confirmed rationalistic solutions to the variety of problems raised in IR interaction.

The challenges in IR research are to *define combinations* of classic IR solutions, *poly-representation, contextualisation, and interaction that are relevant to particular information need manifestations and user knowledge levels*, as well as to encompass *adaptivity, flexibility, supportiveness, and transparency* in IR systems design.

The logical next step in information research is to enhance IR theory *beyond adaptivity* at a contextual level of information processing into a level of truly knowledge-based *self-regulation* at a cognitive level. According to the discussion of De Mey's (1977) evolutionary 'four stages' of information processing (Chapter 2.1), this self-regulatory behaviour requires 'self-generated expectations', or non-imposed pre-suppositions, that are produced by the processing device itself. The paradox is that man is competent of both adaption and self-regulatory mental behaviour; but in case of that the processing device is a machine, man has so far not found means to augment its 'behaviour' beyond adaption. Hitherto, we have not been intellectually capable of conceptualising that situation – nor in a technological sense. Essentially, the question is: how do we regulate ourselves to the unknown?

Meanwhile, it is important to emphasise that both individualistic cognitive and linguistic *as well as* socio-behavioural processes are heavily involved in and influencing IR interaction. As a consequence of this *inherent complementarity* of these scientific approaches, the variety of related qualitative and quantitative investigative methods must be applied to research scenarios in dedicated *supplementary combinations*.

A final aim of this publication has been to suppress the belief that only one method of investigation and evaluation, of representation, IR technique, communication, and intermediary design is the optimal one in IR research. Such isolated attempts have proven to be dead ends for the field. Because of the nature of unstructured data in the form of texts, graphics, images, etc., and the individual qualities of potential users, the answer is to assess the conditions as to when, how and why to synthesize specific retrieval elements with particular means of representation, and definite combinations of intermediary functionalities. The underlying conditions are found outside the proper systems. The vortex is where persons obtain and make use of information.

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