

Models and Modeling

Seminar in Rome, 17-18 May 1996

At the proposal of the Knowledge Organization Working Group which includes members of ISKO, the Italian National Research Council's Institute of Studies on Scientific Research and Documentation organized a seminar on 'Models and Modeling'.

The event, staged at the National Research Council on May 17-18 1996, sought to continue and develop the dialogue which first began in December 1992 with the seminar 'Categories, Objects, and Structures of Knowledge'. Its aim - to spread the principles and methods of conceptual knowledge among scholars from different backgrounds - was once more didactic as opposed to heuristic.

But, whereas the earlier meeting set out to introduce reflection on the 'object' and connected ontological problems on categorization and on conceptual structures, the recent initiative focused on the 'action' of knowledge ordering, on the procedures, which allow us to create concept systems according to a project or methodology.

In her presentation, Giliola NEGRINI, national co-ordinator of ISKO, reminded those present that, as it has developed, the notion of the *model* has consistently acquired scientific validity, to the extent that it is now the tool of one of the most effective forms of scientific practice. She also stressed its role in the representation of the knowledge of mathematical logic, the science of reasoning, which uses formalisms to furnish generally valid solutions.

Modelling has become a fundamental methodological tool for systems supporting decisions, planning, simulation, prediction, automatic reasoning, automatic learning, information classification and the interpretation of empirical data.

It is significant, for example, that the mathematical theory of Concept Lattices was introduced by Prof. Rudolf WILLE to meet an explicit need of psychologists. No less significant is the fact that the Darmstadt Conferences of his Institution at the Technische Hochschule together Ernst-Schröder-Zentrum and with ISKO are attended every year by people with heterogeneous interests and backgrounds.

Modeling is a back-up to concept building even when information is incomplete. The 'Darmstadt School' approach manages to fix available knowledge in any given moment to extract conceptual patterns, but other problems require dynamic techniques and approaches. This is the case of automatic reasoning, for example, which involves a number of 'intelligent' agents with different knowledge and deductive capacities, at times at odds with one another and with asynchronous dynamics. The same dynamic dimension is, necessarily, present in simulation and in action plans.

We are thus faced with two paradigms of conceptualization based on incomplete information: in the first one, incompleteness is due to the static aspect of the paradigm; in the

second one, it is due to its dynamic aspect.

In the first case, the incompleteness is caused by the knowledge system's being 'closed', whereas, in the second one, it is precisely the 'open system' character which implies the impossibility of regarding a cognitive agent's knowledge as complete.

During the Seminar, these problems were addressed to internationally known scholars.

Piero PAGLIANI, who took an active part in organizing the event, introduced the theory of Concept Lattices, presenting a series of significant examples on modeling methodology. Rudolf WILLE spoke on the 'Conceptual Landscape of Knowledge: A Pragmatic Paradigm for Knowledge Processing' and stressed that knowledge understood on the basis of Peirce's pragmatism can be activated by using the metaphor of a landscape. He outlined the idea by discussing conceptual landscapes of knowledge within the developments of *Formal Concept Analysis*. He then went on to consider various knowledge processing tasks, such as exploring, searching, recognizing, identifying, analyzing, investigating, deciding, improving, restructuring, and memorizing, providing examples of concrete applications for each.

Carlo CELLUCCI stressed the difference between *closed systems*, which envisage a closed world concept and are based on the axiomatic method (a theory formulated by Frege and adopted in mathematical logic) and *open systems*, which envisage an exchange with the 'environment', use hypotheses which may change as the system gradually develops, and are based on the analytical method. Detailed analysis of the distinctive features of the second system reveals the need to arrive at the open world concept, legitimated, in part, in Gödel's first theorem of incompleteness. Meeting the conditions imposed by this theorem also implies the need to replace the closed system notion with the open system one. 'Models of complexity' was the subject of Marcello CINI's paper. Cini showed how the new approach, which studies the formulation of complex phenomena, does not seek to unify complex, irregular phenomena by identifying simple, irregular common elements but seeks, on the contrary, to highlight different behaviours in structurally identical systems. It is possible to settle the contraposition between the two approaches by identifying three fundamental characteristics of biological systems which they share with other complex systems: the existence of different levels of organization not stemming from a single structure made up of elementary components; their story's irreducibility to structured factors; and the self-referential character of their internal structure.

Models allow us to study complex natural phenomena and predict future results. A particularly relevant speech in this context was Hellmut LÖCKENHOFF's 'Structuring knowledge for simulation to guide complex societal challenges innovatively', in which he analyzed the following points: Knowledge order for societal control; modelling by the knowledge order to control; radical meta-constructivism; knowledge and control in a virtual (postmodern) society; the pensive aftermath: living in a virtual environment.

Roberto POLI's paper analyzed the difference between *abstraction* and *idealization*. He underlined the various

interpretations of the two concepts in traditional and modern philosophy up to the present century, to Husserl's distinction and the contribution of the Poznan School. He argued that since the study of the difference between abstraction and idealization involves several of the fundamental problems of scientific and philosophical knowledge, then the best general framework for the exploration of these differences is that of the convergence between philosophical analysis and scientific research. Accordingly, we must endeavor to add an element of the scientific to metaphysical research and an element of the metaphysical to scientific research.

The various speeches were followed by lively discussions. This was proof, on the one hand, of the validity of their content and, on the other hand, of the interest which the problems discussed were capable of arousing in an audience of our profession and of scholars with different cultural backgrounds and experiences.

On May 18, Prof. WILLE gave a practical course on Formal Concept Analysis in which he outlined the general principles of the method, made practical applications of the principles by examples and demonstrated implementations using the TOSCANA and ANACONDA management systems.

The proceedings of the May 17 Seminar will be published soon.
Giliola Negrini

3rd Regional ISKO Conference in Moscow

A Call for Papers will be distributed soon to invite interested members to participate in the 3rd Regional ISKO Conference in Russia, organized again by our Russian Coordinator, Dr. Eduard SUKIASYAN, Deputy Director of the Russian State Library.

The topic of the conference will be: *The Universe of Knowledge Organization*; the dates: May 20-22, 1997.

For further information please contact: Dr. E. Sukiasyan, Russian State Library, Vozdvizhenka 3, RU-101000 Moskva. Fax: +7 095 200 2255.

5th German ISKO Conference, Berlin

Wissensorganisation'97 is to be held at the Humboldt University, Berlin, Oct. 8-10, 1997. This time the German ISKO Chapter decided to relate the problems of knowledge organization to the topic of *Multimedia Technologies*. A Call for Papers will soon be released.

The proceedings of its 1995 conference at Trier will be available through INDEKS Verlag, entitled: *Analogie in der Wissensrepräsentation. Case-Based Reasoning and Räumliche Modelle*.

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