INTRODUCTION

Information Technology today penetrates all fields of human activity and is becoming a general element in the functioning of contemporary society. It is an instrument of multi-sided communication and information exchange and embraces all areas of life to an ever-increasing degree. The global dimension of information systems introduced into firms has created diverse communication media and is causing radical changes in world economic and organizational structures. Information techniques and tools are one of the most significant elements in these developments, deciding the global character of management, speed and transfer of information as well as speed of decision making. The development of computerization and telecommunications and the fusion of the two technologies provides managers with ever more effective information systems (adapted to the needs of the user, precise, fast and able to meet deadlines), which are tools in shaping products of high quality and profitability.

The implementation of knowledge-based information projects, which is becoming an important problem for individual companies and for the economy as a whole, involves engaging considerable financial resources and a large implementation risk. In the case of enterprises financed from public money the high costs are linked to considerable social expectations. These expectations as well as the high implementation risk mean that complex research is being undertaken, covering technical analysis of cases of introduction and the possibilities of making use of existing methods, techniques and models to find new solutions in creating knowledge-based systems [14].
In this chapter, existing methods of building knowledge-based systems in **Software Project Management (SPM)** are discussed. New possibilities of modelling these systems are indicated and an example of building a model of a social system is presented—a fuzzy model of information project management. The field of research was narrowed down to implementation of systems by international project consortiums, consisting of several or more **project teams**, understood in work as “distinguished from the structure of the organization, commissioned for a defined period and consisting of specialists from various fields, whose knowledge and experience have a bearing on the problem” [68].

The concept of **knowledge-based systems (KBS)** is used in literature in a variety of senses: Ullman [71], Bazewicz [2], Bubnicki [7], and Hickman [28]. In the present analysis it is taken to refer to an information system with rule-object representation of knowledge in the form of a hierarchical decision network and mixed (before and after) conclusion-drawing type.

The first part presents the state of modelling knowledge-based systems for *SPM*. The existing methods and project tools are presented and methods of assessing project organization are indicated. The second part discusses new ways of creating *SPM* models. The possibilities of applying fuzzy sets and fuzzy regulators are examined. In the third part an example of constructing a model of a fuzzy system of *SPM* is presented, on the basis of the theory of fuzzy regulators and fuzzy systems. First, conceptions of the model are discussed and then details of the model's construction are described:

- **hierarchical**—presenting the hierarchy of levels in managing projects and teams;
- **structural**—emphasising the variables: input and output state, static, dynamic; and
- **fuzzy**—formalizing knowledge with the help of fuzzy sets.

### 1. PROBLEMS OF MODELLING *SPM*

In attempting to build a *SPM* model for a knowledge-based system, the aim of recognising the *state-of-the-art* was set. This knowledge indicates the hierarchy of problems in managing and implementing projects (fig. 1). In management [20] these problems concern access to expert knowledge of *SPM*, use by managers of management methods to support project implementation and application of models for assessing project processes and teams. The consequences of these problems are exceeding the budget, failure to meet deadlines and limitation of the aim of the enterprise [5].

#### 1.1. Expert knowledge of project management

According to *SPM* experts [23], scope, time resources, communication, risk and project changes are inter-related management problems whose occurrence makes knowledge of *SPM* and the experience of implementation described in project experiment documentation important elements in assessing and directing future projects [73]. Access to such documentation is however made difficult because of the unwillingness of firms to