



ELSEVIER

Available online at www.sciencedirect.com



Computers & Industrial Engineering 46 (2004) 363–372

**computers &
industrial
engineering**

www.elsevier.com/locate/dsw

Multiple objective-integrated methodology of global optimum decision-making on mineral resources exploitation

Wei-Xuan Xu*, Yi-Ming Wei

Institute of Policy and Management, Chinese Academy of Sciences, Beijing 100080, China

Abstract

The concept of a complex large system of mineral resource exploitation was advanced from the system theory viewpoint. On the basis of the integrated techniques of qualitative and quantitative analysis, the multiple objective intelligence-integrated methodology for decision-making on mineral resource exploitation was investigated and its integrated model was also formulated. The mineral deposit model, expert system model for mining method selection and the artificial neural network model for prediction economic index, as well as the programming model, acted as the core of this system, while the multiple goal programming model served as the top of the model. An intelligent system to assist the programming of decision-making on mineral resource exploitation for operating mines was developed by means of the systematic combination of optimization technology with an artificial neural network, an expert system, computer-aided design and operations research (OR). The structure of an integrated intelligent system for decision-making on mineral resource exploitation was described. In addition, forecast and simulation, as well as optimization, were integrated. The system's preliminary application was illustrated with an example.

© 2004 Published by Elsevier Ltd.

Keywords: Complex large system; Multiple objective decision-making; Integrated methodology; Mineral resource exploitation

1. Introduction

In the process of mineral resource exploration, which is the exploitation of mineral production, both the human and the mineral system interact and are conditioned on one another. Therefore, human experience, knowledge and the decision-maker's intention play important roles during the decision-making process (Wei et al., 1998). In recent years, rapidly developing modern systems science and computer techniques have provided powerful technological support for the global optimum decision-making on mineral resource exploitation (Sukumar, 1998; Wei and Xu, 2003). In this paper, an integrated technique combining both qualitative and quantitative analyses is used to investigate

* Corresponding author.

E-mail addresses: wxu@mail.casipm.ac.cn (W.-X. Xu), ymwei@mail.casipm.ac.cn (Y.-M. Wei).

decision-making on mineral resource exploitation and to formulate its multiple objective intelligence-integrated methodology.

2. Complex large system of mineral resource exploitation

The object of study in the decision-making of mineral resources exploitation is the system of mineral resource exploitation and utilization. Fig. 1 shows that this system is made up of many different and interacting units. From the viewpoint of system theory, this system is a complete system; here we refer to it as a system of mineral resource exploitation. The systems of mineral resource exploitation have the following characteristics.

1. The system is of high dimension. The system of mineral resource exploitation is composed of at least four subsystems, such as a natural system, operation system and social system, as well as the man-made system, and each subsystem consists of its own subsystems. For example, the operation system consists of a mining system, dressing system and processing system. The mining system is composed of a developing system, a transportation system, a ventilation system and so on. Therefore, the system of mineral resource exploitation is a large system with high dimension.
2. The interactions between subsystems are complex. Subsystems are connected with high complexity, not only in structures but also in content.
3. There are many factors affecting the system of mineral resource exploitation, like the status of mineral resources, the demand of mineral products, industry index, etc.
4. The environmental condition varies. The original object is the complex geology body; hence the exploitation process is difficult to describe with the mathematical model.

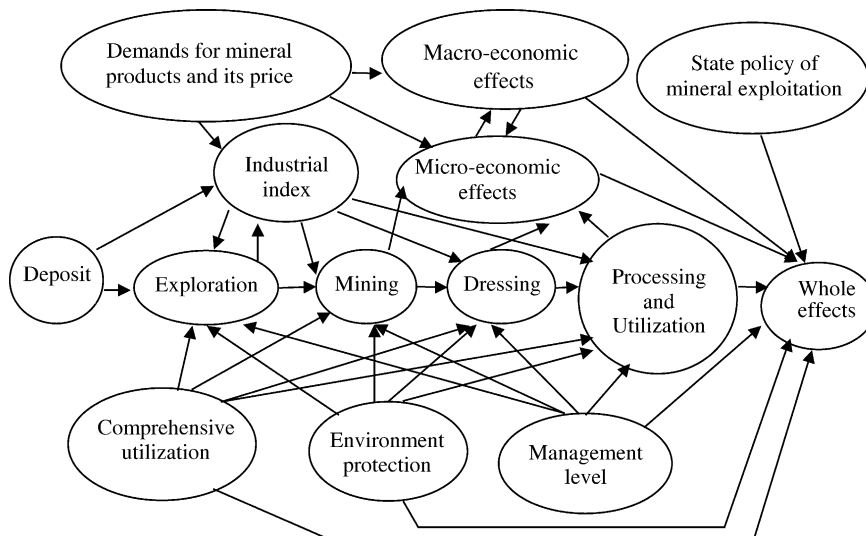


Fig. 1. System of mineral resource exploitation.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات