

# System model for calculating mine profitability

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A new system dynamic model makes it possible to plan the profitability of mining operations with greater precision than before. Researchers in business at Lappeenranta University of Technology, LUT have developed a model based on system thinking that supports investment decision-making by mining companies and helps optimise the guidance of production in mining investments. The model that has been built has already sparked interest among international mining companies.

"The planning of international investments with the help of more detailed models can save tens of millions of euros over a mine's lifespan compared with traditional methods. The savings come from better optimisation of production and better planned investments. The benefits of the <u>model</u> are comparable with the benefits stemming from the optimisation of transport routes" says one of the developers of the model, Mikael Collan, Professor of Strategic Financing at LUT.

The techno-economic system model depicts the activities of mines from the point of view of profitability. The model is relatively extensive. It comprises four parts in which each one has an area that affects the profitability of a mine. The parts of the model are production, cash flow, a project's balance sheet, and profitability. The parts are interlinked, and a change in one part of the model affects the others. By modelling interactions it is possible to create a more realistic image of the reality of <u>mining</u> investments.



## **Revealing effects of complicated investments**

"When mine investments are analysed with the help of the model, simulation is used as an aid. The simulation involves running 5,000 random price paths for metal through the model. After that, results derived from the model are examined, which are usually depicted as distributions. The distributions can show, for instance, the likelihood of a profitable outcome" Collan explains.

"When there is a need to ascertain the value-added that an alternate production product would bring, it is possible to model it and to run a simulation. Comparing the results reveals something about possible valueadded. It is possible, for instance, to find a suitable amount of operating capital for avoiding profitability problems and allowing for the optimum use of a mine" Collan says.

System models can be used for modelling many different kinds of <u>investments</u>, if the system that is to be researched is sufficiently familiar. The research team has several years of experience in mining activities and profitability calculation.

### New in the mining industry

These kinds of models have not been made previously in the <u>mining</u> <u>industry</u> from economic starting points. The use of system dynamic models and simulation is traditionally engineer-oriented and is only now making a breakthrough on the economic side. The increased use is driven by the development of the effectiveness of computer calculation capacity, constantly improving computer programmes, as well as improved training in the field.

Professor Collan considers the use of simulation, system-dynamic



models, and other developed planning methods to play a key role in the creation of industrial competitiveness in Finland, in small, medium-sized, and large companies.

#### Provided by Lappeenranta University of Technology

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