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A methodology for evaluating utilisation of mine planning software and consequent decision-making strategies in South Africa

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ABSTRACT

Mine planning software has and continues to contribute to the development of the South African mining industry. As mine planning software usage continues to be more widespread, it is imperative that a methodology to evaluate mine planning software utilisation for enhanced decision-making strategies in South Africa is established. An existing online database available on the website link http://db.mining.wits.ac.za was developed prior to this study in September 2012 (initial data collection date). However, the database only acted as a snapshot of mine planning software data repository and lacked a framework to evaluate utilisation of mine planning software in the South African mining industry.

In this thesis, a methodology was developed to measure the utilisation of mine planning software to enhance decision-making strategies in the South African mining industry. The methodology for the evaluation of utilisation of mine planning software in various commodity sectors was developed on the basis of three variables, namely, commodity, functionality, and time factor, as a key evaluation criteria. Even though the calculations can be done on any commodity in a similar manner, in this research, calculations were only performed on four different commodities, namely coal, diamond, gold and platinum group metals which are the most significant minerals in South Africa. Six functionalities namely Geological Data Management, Geological Modelling and Resource Estimation, Design and Layout, Scheduling, Financial Valuation and Optimisation were applied on the four different commodities using two different time-stamps (September 2012 and April 2014). The following software providers availed information that was used to populate the database: Geovia, MineRP Solutions, Sable, RungePincockMinarco, Maptek, Cyest Technology and CAE Mining. Note that the CAE Mining data was only made available in April 2014 (second data collection date). However, the results indicated that the market leaders in terms of mine planning software utilisation in South Africa differs, depending on the commodity that is being mined as well as the functionality that is being used.

In addition, this thesis also proposed a framework to estimate the future use of mine planning software on an evolving dataset by considering the fact that the database will be continually updated in the future. By using Artificial Neural Networks (ANN), specifically supervised learning, time-series analyses were performed. Results from

the time-series analyses were used to establish the framework for estimating the future use of mine planning software utilisation in the South African mining industry. By using this newly developed framework, utilisation of the various mine planning software was measured leading to the formulation of different decision-making strategies for the various mine planning software stakeholders.

By using this newly developed framework to estimate and measure mine planning software utilisation, and proposing a framework for time-series analyses on an evolving dataset, this thesis serves a number of beneficiaries; firstly, the South African mining industry to position themselves better by acquiring optimal combination of mine planning software that is being used in South Africa so that they can improve their production levels, secondly, tertiary education institutions and mining consulting firms which make use of mine planning software, and lastly, the aforementioned software providers by strategically positioning themselves in a limited mine planning software market. However, this newly developed framework could be used by involved parties for corporate strategic decision-making.