



Global views

What role can – or should – modelling play in asset management and maintenance planning?
What are its limitations?

AUSTRALIA

Recognising the value of modelling incentivises organisations to prioritise data quality, say Opus International consultants **Travis Gilbertson** and **Bruce Clayton**.

The planning components of an asset management system are more effective if informed by modelling of future asset performance and maintenance expenditure.

Asset performance modelling predicts the future condition and functional state of assets and triggers asset preservation events using defined intervention criteria. This information provides the basis for understanding the potential remaining life of assets and consequently the optimum timing for asset replacement or renewal.

Assessing future works and associated costs can predict an organisation's capital works financial liability over a given period. Accordingly, maintenance effort and associated costs can be predicted by relating historic maintenance cost data to the future condition of the assets. The total financial forecast of all operations and asset preservation works is effectively an estimate of the cost of asset ownership, which is a fundamental investment consideration when reviewing service standards, assessing user costs or comparing asset options.

The accuracy and reliability of modelling outputs depend on two factors: the calibration of the model to represent the real world; and the quality and completeness of the data. Organisations in Australia are recognising the need for quality data and increasingly recording the quality state of their data. Data standards for asset management and investment purposes are also promoting this practice as a means for determining confidence in the data analytics. While modelling is getting more complex, accurate modelling allows for smarter and more focused asset management and maintenance planning.

USA

Modelling can serve two important asset management purposes, says **Jeff Freemyer**, Consultant, Buildings and Infrastructure at Jacobs – if designed for the right outcome measures from the beginning.

The first purpose of modelling is to provide an understanding of a discrete list of activities to be conducted on a specific timeline. The second is to estimate the level of resources required, including labour and financial.

When modelling is done accurately, the predictive aspects – including deterioration, condition and functional elements – become outcome measures that support a portfolio manager's ability to make confident, informed decisions.

Carefully planning the design of the model before undertaking development activities greatly reduces any potential limitations of the model and systematically captures the assumptions within it. Where most models fail is in identifying and analysing the impact these assumptions have on the predicted measures generated by the model. This is known as the sensitivity analysis.

When a model is designed and developed correctly, the assumptions that have the most impact on outcome measure variability are systematically reviewed to ensure the assumption is as accurate as possible, or the model is modified to reduce the impact of the assumption on the outcome measure.

Proper modelling can benefit a wide variety of organisational needs. In particular it links tactical work lists to resource requirements. It also provides portfolio managers with confidence in decision-making, and provides an active measures programme to evaluate asset performance over time. Modelling is a key part of a proactive mature asset management programme.



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UK

The importance of modelling is increasing as asset owners demand more certainty, says **Mick Saltzer**, Director of Consulting Services for Advanced Technology Services.

Research indicates that mathematical prediction models are better than doctors at predicting patients' responses to treatment. So how are mathematical approaches changing the relationship of the Reliability Engineer with their 'patients' – the assets they are responsible for?

Patients rightly want the maximum chance of a successful recovery by combining the right treatment choices. Asset owners now also demand the highest chance of success for their assets and require more than just an opinion on the correct course of action.

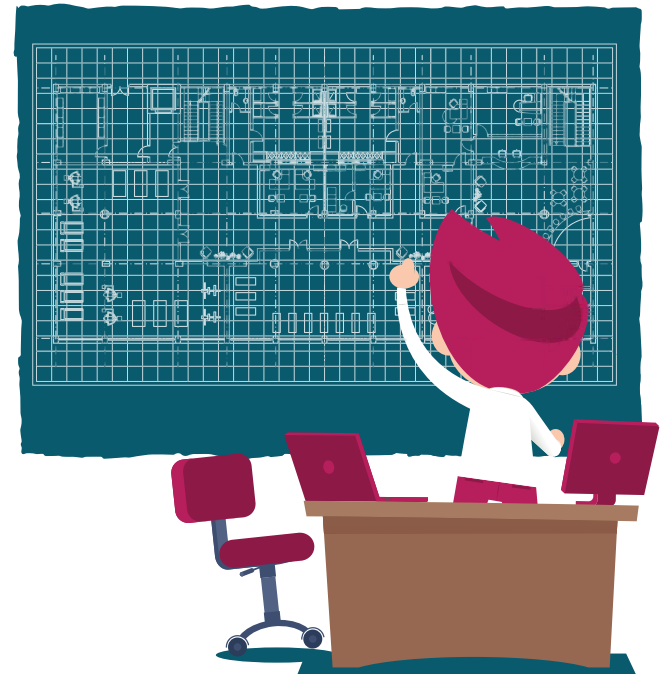
There are many factors that play a role in the diagnosis of asset failures and effective prediction models can combine them all.

The challenge becomes increasingly difficult as more choices become available or additional variables come into play. Mathematical models typically use information from previous events to create a statistical formula that can be used to predict the probability of future outcomes – for instance:

- visualising predicted failures for efficient planning of mitigation actions
- conducting real-time health assessment to better understand the condition and life of assets
- eliminating or optimising traditional maintenance routines.

It is important to note that the accuracy and usability of results will depend greatly on the level of data analysis and the quality of assumptions.

As technology and smart instruments develop, connectivity and data processing speeds improve, and diagnostic tools become more affordable we will see an increasing trend towards an iterative and learning asset environment, defining and implementing corrective solutions without intervention.



NIGERIA

Chidi Umeano, Principal Consultant at Codub Consulting Ltd, says having to coordinate data from different sources and sectors places limitations on modelling.

Model-based condition monitoring is becoming increasingly popular in predictive maintenance programmes. The primary goals are to allow convenient scheduling and to prevent unexpected equipment failures by providing the right information at the right time.

Knowing which equipment needs maintenance means work can be better planned through the optimisation of spare parts, labour, and so on. It is about getting value from money spent, which ties in nicely with ISO55000's definition of asset management: "the coordinated activity of an organisation to realise value from assets".

Most organisations in developing countries adopt a short-term fire-fighting approach, which is one of the limitations of modelling techniques. Likewise, access to authentic past data is a major issue, as in most cases past records do not exist; and where they do, they

are in non-digital formats, making analysis very tedious.

Developing robust models is a challenging task because of the complexity of factors that affect the performance of assets – for instance, the environment in which the assets operate or the skill level of the operators.

In addition, a robust model depends on coordinated activities between various departments in an organisation or between various sectors in a society. In infrastructure projects, for example, coordinating the accuracy of planned, estimated and as-built costs requires coordinating the planning, estimating and construction sectors. The data they generate must be accurate and available to the asset management planners who are forecasting system needs. And there are budget restrictions – there is no such thing as a blank cheque.