# DARIA

# Data-driven risk analysis in road construction

## How STRABAG uses artificial intelligence to support financial risk assessment

Risk management counts in the construction business. It is the basis for early risk identification, the flexible preservation of business opportunities and the effective execution of projects. STRABAG also relies on data and artificial intelligence (AI) for the efficient evaluation of construction projects. With the help of a broad database and algorithms, financial risks can be forecast and, if necessary, reduced. DARIA, the data-driven risk analysis, assesses the financial risks of ongoing road construction projects during the execution phase. This provides controllers and managers with additional AI-generated warning indicators to make early and objective decisions for the course of the project.



**STRABAG**
WORK ON PROGRESS

> AI is a key to the resilient construction of the future. It supports employees in project assessments - data-based, objective and efficient. DARIA proves this.

**Dr. Marco Xaver Bornschlegl,**
Head of Central Division
STRABAG Innovation & Digitalisation

STRABAG is becoming more resilient with DARIA. The Group handles a large number of projects. The evaluation of project progress is an increasing challenge for controllers due to the large amount of data and complexity. This is where DARIA comes in: the computing power of STRABAG KI analyses the commercial data monthly and forecasts project completion according to internally defined categories: top, positive, negative or flop. With the help of AI-based indicators, controllers have a better overview of potentially critical project developments. But it's not just central controllers who have warning indicators at their fingertips. Non-centralised users, such as site managers who check the risks of their projects, also have a flop indicator.

STRABAG uses a broad data basis, the know-how of its own data science department and the expertise of its users. The aim is to identify potentially critical projects at an early stage and minimise risks.

# The DARIA model

**The development and Group-wide use of DARIA is based on three central pillars.**

# AI in practice

Controllers should be supported and relieved by AI in their day-to-day processes. For DARIA to achieve this, users were integrated into the development process right from the start. For example, the specialist know-how of project-related risk management was combined with the technical expertise of the Group's own data science department for the evaluation model. DARIA is integrated into the controllers' digital working environment. Potentially critical projects are visibly labelled and are therefore the focus of the controllers responsible. The display differs depending on the user group: non-central users, such as site managers, are currently notified whether DARIA is forecasting a flop outcome. Their attention is focused on the potentially most critical outcome. Central users receive a more detailed display in which the assessment for all four possible project outcomes is shown like a traffic light system. In both cases, DARIA does not explain which specific risk the AI-based assessment is based on. However, an interpretation aid is provided for users. For example: If a project is predicted as a flop, its progression is visually compared with the progressions of all flop projects from the training data. This makes the forecasts comprehensible for users.
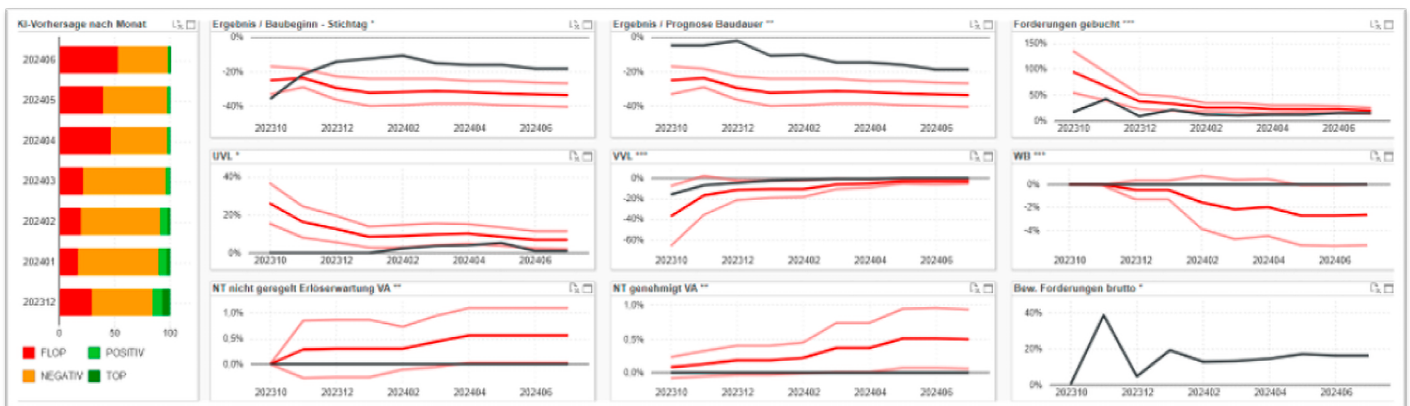


The DARIA dashboard shows central user trends and interpretation aids.

> Given the increasing complexity and data volumes in project controlling, DARIA can contribute to the focused and therefore efficient use of resources.

**Uwe Wedam,**
Subdivision manager BRVZ PRMS

# The right algorithm

DARIA should provide explainable and stable statements,
i.e. always produce the same results.

For this reason, the AI-based approach in DARIA is XGBoost (eXtreme Gradient Boosting).
This model is based on decision trees. In these, data is classified using 'if-then' questions
until the model no longer detects an increase in information. To be as precise as possible,
XGBoost combines several decision trees that build on each other. Each new tree attempts
to correct the errors of the previous tree – known as boosting. This also specifies how much
and in which direction the predictions need to be adjusted – gradient boosting. Sequential
learning produces a very strong model from many weak models. This is also reflected in the
detection rate for potential flop projects, which currently stands at just under 70 percent
after three months of construction.

The developers determine the framework conditions of the model: among other things, how
long and how deeply the algorithm should learn during the training phase or according
to which properties or characteristics the data is classified. However, the model decides
independently how it builds the trees.

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> When developing the DARIA model, the explainability and
> stability of the ratings were a key factor. This creates trust
> and user acceptance.
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> **Marina Ivanova,**
> Senior Function Lead, STRABAG Innovation & Digitalisation
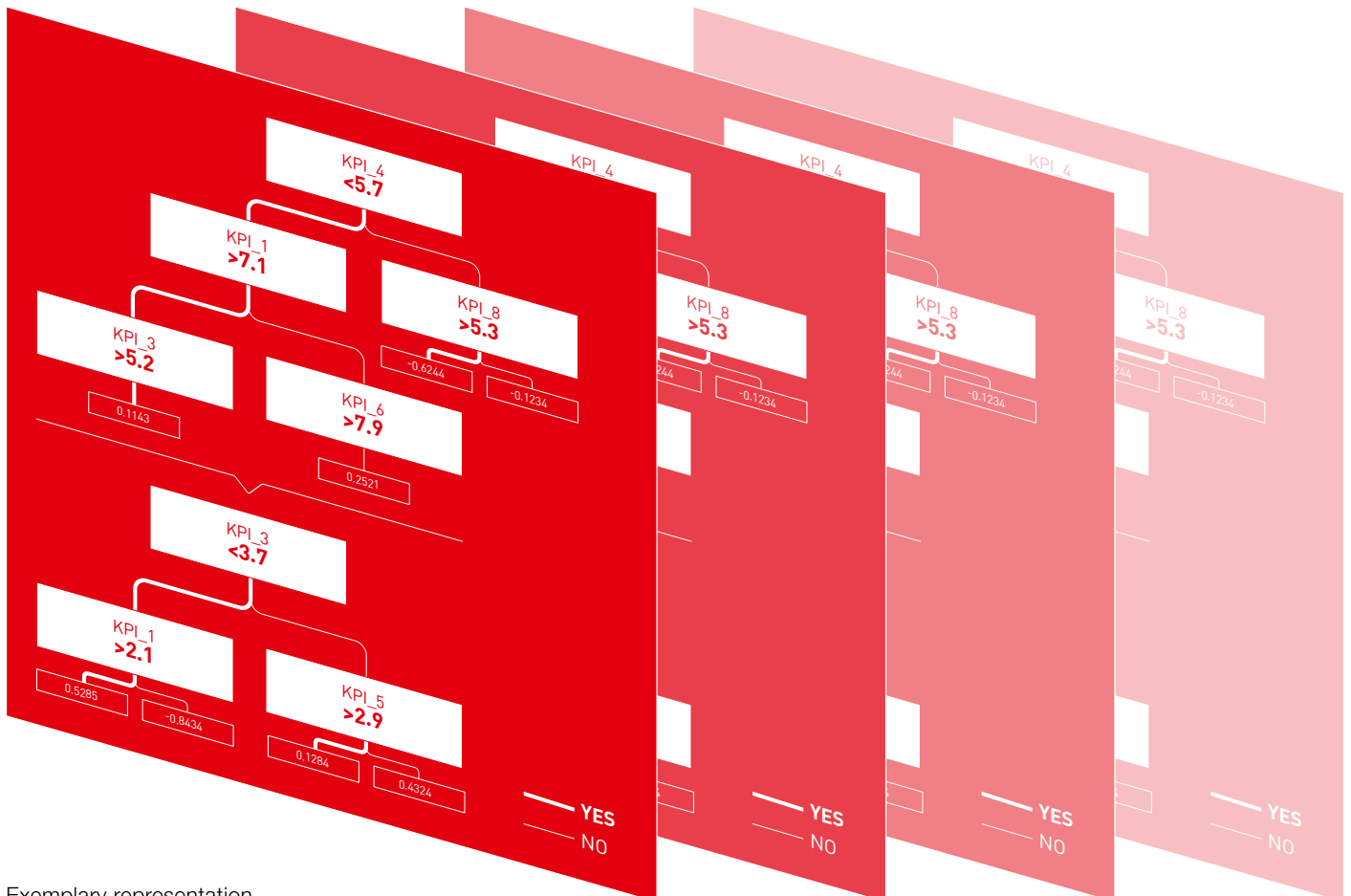


Exemplary representation
of the DARIA model.

## The database

A particular challenge for the development of an AI-based valuation model in the construction industry is the database. To assess the financial risk with an AI model, commercial data, including working capital or supplements, must be analysed in addition to project master data. However, unlike in other industries, the process steps for the execution of construction projects cannot always be reproduced and modelled identically. After all, every construction site is a unique project. But here too, if a large amount of data is considered, patterns can be recognised. Road construction is a sector that has a representative and sufficiently large amount of data, regardless of project size. A valid basis for developing and training a model, starting with road construction.

## A model for all sectors?

The added value of early recognition of project progress is also recognised by users in other sectors. This is why suitable assessment models are currently being developed and evaluated for building and civil engineering projects in the execution phase. And that's not all – the DARIA team is also already working on perhaps the biggest challenge: a model that supports project-related risk management as early as the bidding phase.

# 2.5 YEARS
## UNTIL ROLL-OUT

# ~ 70%
## FLOP DETECTIONS

Contact

**Marina Ivanova**
Senior Function Lead
STRABAG Innovation & Digitalisation

# 12 COUNTRIES

# 11,000
## TRAINING PROJECTS

# >1,000
## MONTHLY FORECASTS

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