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Forecasting the Risks of it Project Implementation on the Basis of Retrospective Project Data

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Existing methodologies for managing the risks of IT projects are predominantly reactive: a risk is entered into the register after a member of the project team has identified it, and is addressed once it has already materialised. This mode of operation means that preventive measures are activated when the cost of applying them is already high and the room for manoeuvre has narrowed. A transition to preventive management requires an instrument capable of estimating the probability of an unfavourable course of events before its overt signs appear.

The aim of this work is to substantiate the structure and composition of the means of forecasting the risks of IT project implementation on the basis of retrospective data on completed projects, and to determine the manner in which the resulting forecasts are to be integrated into a decision support system.

The relevance of the task is reinforced by the state of the field. A recent systematic review of dissertations on IT project risk management defended in Ukraine between 2021 and 2024 identifies insufficient attention to dynamic methods of risk analysis, including artificial intelligence and machine learning, as the first of two research gaps. A case study of digital banking projects in a state-owned bank likewise concludes that the risk classification obtained was validated neither by simulation nor by statistical methods, and names predictive modelling as a direction for further research.

The basis for forecasting is accumulated data on completed projects. Analysis of the practice of implementing banking

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information systems makes it possible to identify groups of features measurable at early stages: parameters of the project itself, namely the planned duration of stages, the number of adjacent systems with which integration is performed, and the volume of data migration; parameters of the team, namely its size, the share of external contractors engaged, and staff turnover; dynamic characteristics of execution, namely the number of requirement changes per period, the deviation of actual stage durations from planned ones, and the number of returns for rework; and regulatory features, namely the need for approvals, information protection requirements, and constraints on service availability.

The target variable is the occurrence of an unfavourable event: a substantial overrun of budget or schedule, a critical failure after commissioning, or the detection of non-compliance with regulatory requirements. The task is formulated as classification with an estimate of the probability of belonging to the class of risk-prone projects.

In selecting methods, the characteristic constraints of the subject area must be taken into account. Samples of completed projects within a single organisation are small — tens, more rarely hundreds of observations — and the classes are substantially imbalanced, since projects with critical consequences are few. Under such conditions complex models are prone to overfitting, and it is therefore advisable to begin with interpretable baseline models, in particular logistic regression, using them as a point of reference, and to move to ensemble methods based on decision trees only when a sufficient volume of data is available. A separate requirement is interpretability: in a banking environment a forecast that cannot be explained will be accepted neither by project management nor by internal audit.

The question of integrating the forecast into the overall model is of fundamental importance. It is proposed to use the result of forecasting not as an independent risk estimate, but as a source of prior probabilities for the basic events of the cause-and-effect model constructed by means of fault tree analysis. Such a combination preserves the structural transparency of the risk model while allowing the input probabilities to be refined from actual data rather than from expert judgement alone.

A separate consideration is the verification of the approach under conditions of restricted access to internal banking data. Open datasets of software projects are available, including a set collected at one of the largest

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commercial banks in Finland, which makes it possible to test the method within the banking domain without recourse to internal sources. Since these datasets were compiled for effort estimation rather than for risk assessment, the target variable is constructed as the exceedance of the upper prediction bound of a baseline size-based estimation model — a construction consistent with the interval representation of risk adopted here.

The software prototype implements the stated sequence: preparation and normalisation of retrospective data, training and validation of the model on a hold-out sample, transfer of the resulting probabilities to the fault tree computation module, formation of final risk indicators with confidence bounds, and their visualisation for the decision maker.

Conclusions. A transition to preventive management of IT project risks is possible provided that statistical forecasting from retrospective data is combined with a structural model of cause-and-effect relations. This approach preserves the explainability of the result, which is a mandatory requirement for the banking sector. Two-stage verification — first on open datasets outside the domain, then on open banking-domain data — makes the results reproducible independently of access to internal sources. Further research is directed towards verification of the prototype on anonymised data from projects implementing banking information systems.

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